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The Outlook

"What Stands if Freedom Fall?"

AT the present tremendous moment the words of Rudyard Kipling, written in 1914, inevitably come to the mind. At the moment of writing it seems that only a miracle can avert the calamity of war, but if war it must be Britain and France will draw the sword with clean consciences in defence of all that is meant by the word freedom. Together they are invincible.

For the first time, it seems, the initial offensives in the West would be made by the bomber forces of both sides. Authorities are agreed that Germany does not possess the materials, such as steel and oil, for a long war, and this must dictate her strategy. She might hope to beat Britain to her knees by a concentrated bombing of London, or perhaps of a number of British cities. Field Marshal Goering has often said that his air arm would be used ruthlessly. Of course, such tactics must fail, for two reasons. The British people are the toughest in the world, and, secondly, our air defences are very strong.

British tactics would certainly be very different, in the first place because our nature abhors brutality, and also because our strategy does not necessitate a lightning victory. The longer the war lasted the more certain would our victory become. Our bombers would be directed against military objectives. We should use them as long-range artillery against targets which the guns would shell if they could reach them. The destruction of a munition factory certainly helps to win a war; the killing of civilians only inflames the other side, and is, in fact, the waste of a good bomb.

We must, however, discriminate. Either shells or bombs may miss their targets and kill a few civilians. That is not "frightfulness"; it is an accident. The enemy, likewise, are not to be blamed if such an accident should take place. Deliberate bombing of civilians is inhuman and as much against the rules of war as would be the bayoneting of them in cold blood.

Our Possible Targets

IT is not yet clear what Army movements are possible in the West. We are confident that the Maginot line is impregnable, but there is not the same certainty about the Siegfried line. Recently it flooded, and the Germans have been, it is reported, moving sections of it back to higher ground. There might be an assault on those sections. In any case, it appears that one way in which the Allies could help Poland would be by furious bombing assaults on points in Western Germany. That the British and French crews would drive those attacks home with the utmost determination may be taken for granted. The German air defences would be tested to the uttermost. Perhaps the outcome of operations on the Western front, if war does come, may enable some conclusion to be reached as to whether air defence or air attack has the upper hand.

Certainly the Germans would have to keep strong forces in readiness behind the Siegfried line, and it would be one task of the French and British bombers to attack the lines of communication behind those forces, to interfere with the moving up of reinforcements and with the supply of food and ammunition to the front line. In that way air action might open up the way for an advance on the ground. Our air offensive might also force the enemy to keep at home such bombers as can easily be converted into fighters, and so relieve the pressure on our own cities.

The Mediterranean

THE words of dictators mean that they will do what they say just so long as it suits their purpose to do so. For that reason we accept the assurance of General Franco that Spain will remain neutral, as obviously that country needs peace above all things. But what about Signor Mussolini? What can it profit a Medi-

terranean nation, which lives and moves and has its being by its sea-borne trade, to fight against two naval Powers whose fleets are much more powerful than its own?

It has been suggested that Mussolini relies on submarines and aircraft to drive the British and French fleets out of the Mediterranean. The British Navy scoffs at such an idea. Those weapons might do some damage, but they would not prevent the Allies from dominating the sea. Naval blockade of the Italian coast would soon spell ruin for that country. In addition Ethiopia with its 200,000 troops, Libya, and the Dodecanese islands would all be cut off from help.

Nor would air power be all on one side. We have recently given a demonstration of the range of our Wellingtons, and if they were to fill their tanks on a Riviera aerodrome there would be no hostile spot in the Mediterranean which they could not reach and return from it. Of course, we repeat, our bombers would not attack Italian civilians. We have no desire to lay waste the Forum of Rome or the piazza of Venice, or any other of the artistic treasures of Italy. There are plenty of military targets. In fact, war with France and Britain must spell ruin for Italy.

The neutrality of Spain is a matter of importance, for it relieves us of all fear of enemy bombers attacking Portsmouth and other south coast towns from the northern coast of Spain. Raids which do not have to fly inland, where our Observer posts are working, are admittedly harder to intercept.

Our Home Defence

"YOU cannot scare great nations into submission by destroying their capital cities," said Marshal Foch in an interview in 1926. Most emphatically that is true. It should be added that capital cities are not easily destroyed. The feat, in fact, is impossible. If the enemy were wise he would not attempt it. We must, however, remember that Germany is a nation which has a natural inclination to "frightfulness" in war, and never seems to realise its futility.

London, and perhaps other places, may have to face up to the prospect of damage and loss, and we all know that the grit of British citizens will be no less than that shown by the Spaniards when their cities were bombed in the civil war. We do not believe that the damage could be anything like so great as pessimists have imagined.

The recent air exercise has increased our confidence, for the work of both observers and fighters was excellent, and the whole organisation worked very smoothly. Few, if any, raids escaped the Observer Corps, and probably well over 70 per cent. of the raids were intercepted by fighters. The guns, of course, were silent, but when they play their part the damage to the raiders must be still greater. No bombing force, however gallant, could for long keep up raiding in face of such casualties as we should inflict.

DIARY OF FORTHCOMING EVENTS—Page *d*.

DEFENCE : A Spitfire preparing for a dawn patrol is typical of our preparations. In 1918 we finally repulsed the raiders of London, and we are far stronger now.

FORCED "LANDINGS" AT SEA

How Safeguards Operate in Fleet Air Arm Machines

ONE result of the expansion of the Royal Air Force, and with it the Fleet Air Arm, is the increase in the number of forced descents, proportionate to the increase in the number of aircraft in daily use. Forced descents, unless accompanied by loss of life or damage to property, or made in some spectacular manner, are so common nowadays as to attract little general interest, yet there will always be a certain dramatic moment when an aircraft is forced to descend into the sea. Strangely enough, little has ever been told of such descents, and it seems to be a popular misconception that there is little chance of survival for the occupants of aircraft that meet with this emergency. Actually, the reverse is the case and it is rarely indeed that such accidents are attended by tragedy.

It is now a normal occurrence for Service aircaft to operate over the sea, many miles from their base on shore or carrier, sometimes flying for hours with nothing but an empty waste of water beneath them, their only contact with their base being made by wireless telegraphy. Special safeguards have, therefore, been introduced in an effort to anticipate and avoid disaster to the personnel of these aircraft in the event of their being plunged into the sea.

All occupants of sea-going aircraft are provided with an item of equipment known, in official nomenclature, as a life-saving waistcoat, but invariably referred to by officers and airmen alike as a "Mae West." This is a rubber tube hung around the neck and contained in a waistcoat-like garment, having a mouthpiece conveniently situated for self-inflation by the wearer. Its function is the same as that of any other type of life-jacket—to support a person in the water.

Automatic Life-saving

A second and more important safeguard is the provision of a collapsible dinghy. This, in one form or another, is a light rubber affair snugly housed, in a deflated state, in a wing or other part of the aircraft, from which it can easily float free when detached. Immediate and speedy inflation is achieved by automatic action, though a manual release is provided as a safety factor. Attached to the dinghy is a cylinder of highly compressed gas (CO_2) which has, screwed to one end, a piece of mechanism called an "operating head." Briefly, this ingenious little gadget is a trigger-action affair that pierces the metal cap sealing the cylinder. Leading from the operating head are two open-ended pipelines, each one leading to different parts of the forward end of the aircraft, one always positioned as low as possible—on the undercarriage, for instance. These form part of the automatic release. The manual release is a Bowden cable, to which is attached a hand-grip positioned within easy reach of the pilot. The dinghy itself, which is of ample size to accommodate the occupants of the aircraft, is equipped with a pump in case additional inflation is required, and a signal rocket having a tear-off ignition strip attached, for use if the descent is made at night.

So much for the safeguards. Now we will see what happens when the aircraft "lands" on the water.

We will assume that the engine has ceased to function—the most frequent cause of forced descents. The pilot has no need to concern himself with finding a suitable place to alight—the ocean is beneath him and there will be no damage to property or third parties. Should there be any sort of sea craft in sight he will endeavour to glide as near to it as possible so that little time will be lost in his being picked up. In any case he will not be unduly alarmed but will calmly proceed to alight, freeing himself as he does so of his safety harness and any other encumbrances that might trap him in the cockpit.

In this photograph, the place where the automatically inflated dinghy has burst out of its housing in the wing can be seen.

Meanwhile, the observer or telegraphist will have tapped out an S.O.S. and, should there be a few seconds of time, his position. He, too, as well as any other occupant, will have divested himself of his trappings. The "landing" is made normally, though the shock of impact will be greater than that of landing on an aerodrome or carrier. Immediately the aircraft settles water enters the open end of the lowest pipeline of the operating head. This compresses the static air inside and releases the trigger that pierces the cap on the gas cylinder, thus inflating the dinghy. Should, for some reason, the first pipe be blocked, or fail to operate, it is a matter of seconds before the water reaches the second, with the same result—the releasing of the trigger. Should both pipes be blocked, a most unlikely event, then the pilot will pull the manual release, which never fails to function. The pressure of air needed to set off the trigger is slight and before the aircraft has been on the water for many seconds the dinghy literally bursts its way out of the housing, and floats free.

Meanwhile, the occupants of the aircraft, having swum clear, make for the dinghy, supported by their "Mae Wests." Around the dinghy are rope handgrips and two tiny rubber ladders, to enable the swimmers to clamber into it. Usually, before the dinghy is reached the aircraft has sunk and become a total loss.

All that remains now is for someone to come along and pick up the occupants of the dinghy. If the aircraft was forced down near to a ship this will be only a matter of minutes, but the descent may have been made off the trade routes and many miles away from the base, be it shore or ship. In such a case searching aircraft will soon be on the scene, even when there has been no time to send out an S.O.S., for after an aircraft has ceased to make radio communication no time is lost before a fleet of aircraft is winging its way in the direction of the area in which the "silent" aircraft was known to have been operating.

So, although a forced descent on to the sea has its thrills and hazards, it is rare that the pilot and his crew suffer greater harm than a soaking and, at most, an hour or so floating around in a rubber dinghy. P. W. L.

A 36-cylinder Wright?

THE Wright concern is said to be developing a 36-cylinder air-cooled radial, the cylinders being arranged in four banks of nine. The most powerful Wright engine so far announced is the Duplex Cyclone of 2,000 h.p.

Rossi's Record

FOLLOWING his unsuccessful attempt on the 10,000 km. closed-circuit record, mentioned in *Flight* last week, the French pilot Rossi, accompanied by a wireless operator, has covered that distance at an average speed of 311.621 km./hr. (over 193 m.p.h.), thus depriving Italy of the record. Rossi used the special Hispano-powered Amiot.

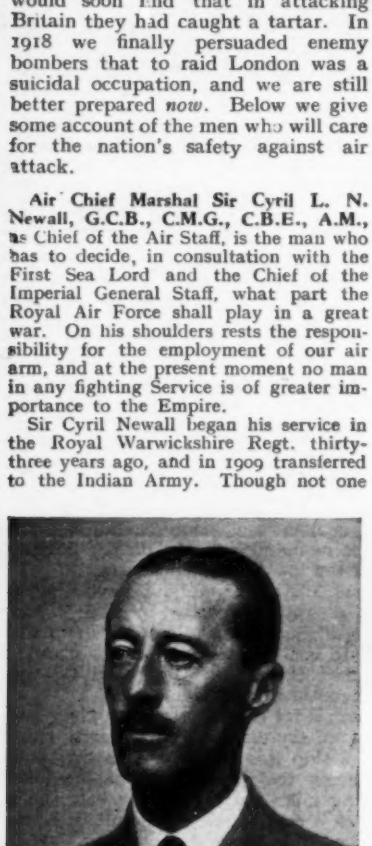
THE HIGHER COMMD

Some Notes on the Co

AS we go to press the situation is critical, and the prospect of war will have made readers interested to know something of the fighting organisation of the Royal Air Force and of the officers who would command its fighters and bombers in war. Our bombers would take the offensive and would try to drive the enemy to defend himself, and would also give potent help to the Army. Our fighters and the ground troops which work with them would take care to make it so hot for any enemy machines which attempted to raid us that we all feel sure they would soon find that in attacking Britain they had caught a tartar. In 1918 we finally persuaded enemy bombers that to raid London was a suicidal occupation, and we are still better prepared *now*. Below we give some account of the men who will care for the nation's safety against air attack.

Air Chief Marshal Sir Cyril L. N. Newall, G.C.B., C.M.G., C.B.E., A.M., as Chief of the Air Staff, is the man who has to decide, in consultation with the First Sea Lord and the Chief of the Imperial General Staff, what part the Royal Air Force shall play in a great war. On his shoulders rests the responsibility for the employment of our air arm, and at the present moment no man in any fighting Service is of greater importance to the Empire.

Sir Cyril Newall began his service in the Royal Warwickshire Regt. thirty-three years ago, and in 1909 transferred to the Indian Army. Though not one



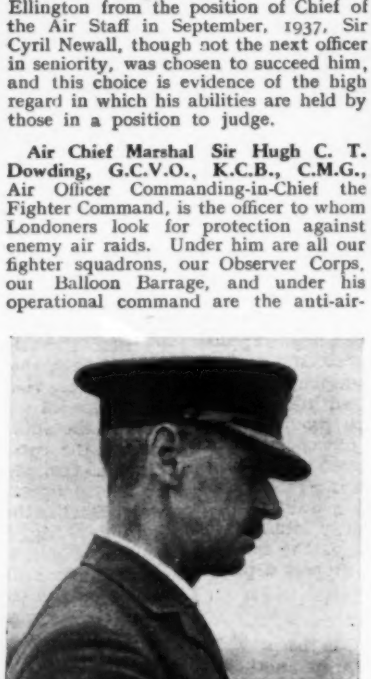
Air Chief Marshal Sir Cyril Newall.

of the pre-war officers of the R.F.C., he joined it in September, 1914, and soon went to France. His promotion was rapid, and at the battle of Loos in September, 1915, he was a Major, commanding No. 12 Squadron, which was stationed at R.A.F. headquarters at St. Omer. Next year he was awarded the Albert Medal for conspicuous gallantry in saving life, and later received the C.M.G. and the C.B.E. for his war services, as well as several foreign decorations.

Since the last war he has held a number of appointments, mostly in this country, of which the most notable was command of the Wessex Bombing Area in 1931. He also was once employed with the League of Nations Disarmament Committee. After handing over the W.B.A. to his successor, he was appointed A.O.C., Middle East Command.

On the resignation of Sir Edward Ellington from the position of Chief of the Air Staff in September, 1937, Sir Cyril Newall, though not the next officer in seniority, was chosen to succeed him, and this choice is evidence of the high regard in which his abilities are held by those in a position to judge.

Air Chief Marshal Sir Hugh C. T. Dowding, G.C.V.O., K.C.B., C.M.G., Air Officer Commanding-in-Chief the Fighter Command, is the officer to whom Londoners look for protection against enemy air raids. Under him are all our fighter squadrons, our Observer Corps, our Balloon Barrage, and under his operational command are the anti-air-



Air Chief Marshal Sir Hugh Dowding.

craft guns and searchlights of the Territorial Army. It is an elaborate organisation, and it guarantees, so far as is humanly possible, to hit any raiders so hard that they will soon stop raiding.

Sir Hugh Dowding was in the Royal Artillery when the last war broke out, and joined the R.F.C. in 1914. In that year he passed through the Army Staff College at Camberley. He was intimately connected with the development of wireless signals in the R.F.C. No. 9 Squadron had become the unit which specialised on wireless, but in the spring of 1915, some reorganisation was found necessary, so the squadron was disbanded, and Capt. Dowding took half a dozen of the technical personnel back to England and reformed the squadron at Brooklands, where it became practically the first wireless school in the R.F.C. For his services in the war Sir Hugh received the C.B. and C.M.G.

Since the last war Sir Hugh has held many appointments, serving on the staff in Iraq and Palestine. He has been Air Member for Research and Development on the Air Council, and commanded the Fighting Area before that organisation was raised to the dignity of a separate

Air Chief Marshal Sir Edgar Ludlow-Hewitt.

Command under an A.O. Commanding-in-Chief.

Air Chief Marshal Sir Edgar R. Ludlow-Hewitt, K.C.B., C.M.G., D.S.O., M.C., is the Air Officer Commanding-in-Chief, the Bomber Command. This ranks first of the R.A.F. Commands at Home, because the bomber squadrons are our air striking force, and it is held that attack is the best form of defence. Under the A.O.C.-in-C. are many Bomber Groups, which he can allot to various targets. If it is to be war, those Groups will presumably operate overseas, and we at Home may see little of them. When frontiers are strongly fortified, bomber squadrons become a most important feature of our attack on the enemy. They will undoubtedly assail his military points and will not be used for slaughtering his civilian population.

Sir Edgar Ludlow-Hewitt joined the R.F.C. from the Royal Irish Rifles in August, 1914, went to France with No. 1 Squadron in time for the battle of Neuve Chapelle in March, 1915. The squadron had four B.E.8s and eight Avros. During the battle Capt. Ludlow-Hewitt hit the railway at Wavrin with a 100lb. bomb. During the course of the war he was awarded the Military Cross, the Distinguished Service Order, and the Companionship of St. Michael and St. George.

Since the Armistice Sir Edgar has been much employed at the Air Ministry, but has also been Commandant of the R.A.F. Staff College and A.O.C. in Iraq and in India.

Air Marshal Sir Frederick W. Bowhill, K.C.B., C.M.G., D.S.O., is the Air Officer Commanding-in-Chief the Coastal Command, the third of the fighting air commands in this country. The work of his Command is, however, reconnaissance rather than fighting, for it means scouring the seas round the coasts of the British Isles to search for enemy submarines or surface vessels. When an aircraft sights such a craft it may attack it with bombs, but it will certainly send reports to the shore base so that a striking force, perhaps of aircraft, perhaps of naval vessels, may be sent out to ensure the destruction of the enemy.

...MD of the ROYAL AIR FORCE

...the ... Control Britain's Air Arm

Sir Frederick is himself an old naval man. Born in India in 1880, he was educated at Blackheath School and on board the training ship, H.M.S. *Worcester*, which lies off Greenhithe, Kent. He received a commission in the Royal Naval Reserve, and in 1913 he learnt to fly, receiving the Aero Club certificate No. 397. He was then appointed a Flying Officer in the Royal Naval Air Service.

On Christmas Day, 1914, he was on board the carrier *Empress* when her seaplanes took part in the raid on Cuxhaven. In August, 1916, he was Squadron Commander of No. 8 (Naval) Squadron which was sent to East Africa to help Gen. Smuts' force. He had brought his squadron there from Mesopotamia. He won the D.S.O. and bar, was mentioned seven times in despatches, and also received the C.M.G.

In 1919, as a Wing Commander, he was chief staff officer to the secret "Z" expedition to Somaliland, when aircraft speedily found and routed the "Mad Mullah" who had given the British Army trouble for many years. This was the first campaign to be settled by the Royal Air Force practically "on its own."

After that Air Marshal Bowhill served in Egypt and Iraq and at the Air Ministry. In 1931 he became A.O.C. the Fighting Area. On the reorganisation of

Air Marshal Sir Frederick Bowhill.

the R.A.F. in 1937 he was appointed to his present Command.

The Balloon Command is a new creation, but its organisation has to be spread all over the country, and divided into a number of Groups. The first A.O.C. of this Command is **Air Vice-Marshal Owen Tudor Boyd, O.B.E., M.C., A.F.C.,** once an officer of the Indian Army. He joined the R.F.C. in 1916 and then served in France and Mesopotamia (as Iraq was then called). For his services during the war he received the O.B.E., the M.C., and the A.F.C., an assortment which imply courage and other qualities as well. He has commanded the British forces in Aden, and has had experience of both the fighter and bomber organisations in this country, as well as having done a period at the Air Ministry as Director of Personal Services.

THE GROUP COMMANDERS

In the Bomber Command there are a number of Groups. As bomber squadrons must operate overseas in the time of war, there is no point in mentioning their Home stations, and it would obviously be inadvisable to state the type of machine with which each is equipped, but some account of the officers who command certain Groups may be given.

No. 1 GROUP is strong in squadrons. The Air Officer Commanding is **Air Vice-Marshal P. H. L. Playfair, C.B., C.V.O., M.C.** He joined the R.F.C. from the Royal Artillery in 1912, on the formation of the Corps, and went to France in 1914 with No. 4 Squadron. At the Battles of the Somme he commanded No. 8 Squadron. He served throughout the war, and won the Military Cross. In recent years he

Air Vice-Marshal Playfair.

has commanded the Central Flying School and has been A.O.C. in Palestine and Transjordan, where he rendered distinguished service during the disturbances in 1929. After that he did a period on the staff in India.

No. 2 GROUP has as its Air Officer Commanding **Air Vice-Marshal C. T. Maclean, C.B., D.S.O., M.C.** He is a New Zealander, and began his service in the Dominion's forces in 1911. In August, 1914, he was appointed to the Royal Fusiliers and was seconded to the R.F.C. at the end of 1915. In the war he won the M.C. and the D.S.O. Since then he has served in Iraq and Egypt, and has been A.O.C. Aden.

Group Captain Arthur Coningham, D.S.O., M.C., D.F.C., A.F.C., was appointed A.O.C. No. 4 GROUP last June. He was born in Queensland in 1895, but served for the first three years of the Great War as a trooper in the New Zealand forces. In the latter half of 1916 he was given a commission in the Special Reserve of the R.F.C. and graduated at the Central Flying School. He displayed great gallantry as a pilot and was awarded the D.S.O., M.C., and D.F.C. In 1920 he returned to the C.F.S., by then reorganised as a school for instructors, and qualified. Later on he commanded No. 55 Squadron in Iraq, and next year saw more fighting in the Kurdistan operations, when he was again mentioned in despatches. He served for considerable periods on the staff of the Middle East Command at Cairo, and took part in the Cairo-Kano formation flight of 1925. In 1935 he returned to this country, where he has held various posts, including the command at Calshot station.

No. 5 GROUP is under the command of **Air Commodore W. B. Callaway, A.F.C.,** who is an old naval officer. He has served on H.M.S. *Furious* and has commanded the station of Calshot, which is very nautical in character, as well as No. 203 (Flying Boat) Squadron. He has also done a period at the Air Ministry.

Air Vice-Marshal R. E. Saul, D.F.C., is A.O.C. No. 13 GROUP, which was formed in July. He is 48 years of age, and commenced his career in the Army Service Corps, in which he passed the first two years of the war. All war-time soldiers remember with gratitude that the A.S.C., which received the prefix "Royal" at the end of the war, was one of the most efficient supply branches of the Army. In August, 1916, Saul transferred to the R.F.C. and served in the air for the rest of the war. In January, 1919, he commanded No. 7 Squadron, and in that month was awarded the Distinguished Flying Cross. Later in the year he received the Belgian Order of the Crown and the Belgian Croix de Guerre *avec palme*. After the Armistice he commanded No. 12 Squadron with the Army of the Rhine. In 1927 he took a two-year course at the Army Staff College, Camberley, and in 1930 he commanded the School of Army Co-operation. He has also commanded No. 203 (Flying Boat) Squadron at Basra.

No. 18 GROUP has its headquarters at Rosyth, and its A.O.C. is **Air Commodore C. D. Breese, C.B., A.F.C.** Obviously the Group is concerned with reconnaissance over the North Sea and must work in collaboration with the Fleet. The A.O.C. himself is an old naval officer of the Engineer branch, who joined the R.N.A.S. in July, 1914, just before the outbreak of war. He was wounded in air combat in May, 1917, and at the end of the war was granted the Air Force Cross. After the Armistice he commanded the Central Flying School at Upavon. Then he went to India and commanded the Depot at Karachi, a post for which his engineer training had specially qualified him. He also had an engineering post later on when on the staff in Iraq, where he saw service in the operations in Northern Kurdistan in 1931-2 and was made a C.B. He has also held several appointments in this country.

From the Bomber Groups we turn to the Groups of the Fighter Command. They are two in number, and briefly it may be said that the task of No. 11 GROUP is the defence of London, while

Air Vice-Marshal Gossage.

No. 12 GROUP has the Midlands and the North in its charge.

Air Vice-Marshal E. L. Gossage, C.B., C.V.O., D.S.O., M.C., holds the responsible position of A.O.C. No. 11 GROUP. He was originally a gunner officer, who was seconded to the R.F.C. in 1915 and was decorated with the D.S.O. and M.C. for gallantry during the war. As an officer of the R.A.F. he passed through the Army Staff College at Camberley and became an instructor at that College. He also maintained a connection with his original Service when he commanded the School of Army Co-operation at Old Sarum. He has been Air Attaché at Berlin, has commanded the British Forces in Aden, and has been on the R.A.F. staff in Iraq. He was given command of No. 11 Group in September, 1936.

No. 12 GROUP covers a wide area. The A.O.C. is **Air Vice-Marshal T. L. Leigh-Mallory, D.S.O.,** who was commissioned from Cambridge to the Lancashire Fusiliers in 1914. During the Amiens offensive in 1918 he was in command of No. 8 Squadron, equipped with eighteen Armstrong-Whitworth machines, and was placed in charge of experiments in communicating from the air to tanks. These proved to be most valuable. Of late Air Vice-Marshal Leigh-Mallory has been senior air staff officer in Iraq. He has also commanded the School of Army Co-operation and has been an instructor at the Army Staff College, Camberley. He is young for his rank, being only 47 years of age.

Air Vice-Marshal Leigh-Mallory.

The late Air Comdre. A. A. B. Thomson.

No. 3 GROUP was commanded by **Air Commodore A. A. B. Thomson, M.C., A.F.C.,** who was one of the officers of No. 5 Squadron when it flew to France in August, 1914. He was then on the Special Reserve of the R.F.C. By 1916 he had risen to the rank of Major and was commanding No. 33 (Home Defence) Squadron at Gainsborough. Just as we go to press it is learned that Air Comdre. Thomson was killed last Monday by walking into a revolving airscrew.

C. G. GREY RETIRES

AFTER a long career as Editor of *The Aeroplane* Charles G. Grey, most prominent of Britain's pioneer aeronautical journalists, is retiring. Just prior to the Rheims flying meeting in 1909 C. G. Grey, who was at that time in the employ of Iliffe and Sons, Ltd., was detailed to study aviation matters for *The Autocar*. Later in that year *The Aero* was produced by the same publishers, edited by C. G. Grey and the late W. Gordon Aston. *Flight*, which had been founded by Mr. Stanley Spooner at the beginning of the same year, was confronted, two years later, with a rival in *The Aeroplane*, which C. G. Grey introduced after leaving Iliffe and Sons.

Many prophesied an early demise of one or both of these pioneer journals since, they asked, how could an almost non-existent industry support two weeklies? History has provided the answer, for their struggles and pioneer work in the national cause has frequently been acknowledged in high quarters, and it is conceded on all sides that, side-by-side, the two journals have done their task of upholding British aviation prestige through good times and bad, through peace and war.

That "C.G.G." will no longer direct the destinies of our contemporary seems almost unbelievable. The names of C. G. Grey and *The Aeroplane* have been synonymous for so long a period that one had come to regard them as inseparable.

Many will regret the retirement of C. G. Grey. He has served a long term of activity in the great cause. If his outspoken and fearless criticism has aroused the ire of many sections of the community, both at home and abroad, his views have often been respected and have acted as a goad to further effort. After more than thirty years of active journalism in the interests of aviation we would like to pay our tribute to Charles G. Grey, a worthy opponent, and to extend to him the good wishes of *Flight* in his well-earned retirement.

To his successor, Mr. E. Colston Shepherd, we offer a hearty welcome.

Concentrated Experience

"How We Fly," edited by Norman Macmillan; 7s. 6d., The Guild of Air Pilots and Navigators, 14, Thavies Inn, Holborn Circus, London, E.C.1.

IF this book had been published as a serious commercial venture, it might or might not have been a best-seller in aeronautical literature, but it would certainly be considered as a remarkable and original effort.

Wonderful are the effects of charity requirements. A dozen experts, in the true sense of the word, have been encouraged, without much difficulty, to write good and sound articles to fill this book—and that for no gain to themselves. One doubts if half that number could have been brought in to contribute, even at large fees, for a commercially minded publisher. Certainly they would not have produced the articles at such short notice. Incidentally, not only were the contributions free, but the printing cost nothing, and the entire proceeds from the sale of this book are being devoted to the G.A.P.A.N. Benevolent Fund.

By way of a start, Sir Francis Shelmerdine has contributed an article explaining the history and work of the Department of Civil Aviation—with a most useful family tree explaining the position and work of the different members of the Department. Logically following this is a short survey, by Capt. Norman Macmillan, of the development of British commercial types, with a series of historically interesting photographs to follow. Not many people remember the Vickers Vulcan or the Supermarine Sea Eagle, which was used for the Guernsey service in the 1924 era; they are there with all the others which have been used since the early days.

Though it is invidious to mention some contributors and not others, there are twenty-one of them. Those not mentioned will have to take the will for the deed. Of the specialists, Major Hemming writes on air survey, Lt. Col. Outram on production, Capt. Lamplugh on aviation insurance, Capt. Wilcockson on regular Atlantic services (at great length), Wing.-Cdr. Brown on accident investigating, and Mr. Brie on rotating winged aircraft.

There are many others, all well-known, but this list will suffice to explain the idea. For the more curious, it can be said that everything from soaring to safety, from meteorology to radio methods, and from tricycles to training is given due and expert attention—with a couple of not too serious articles by "A. Viator" and "Indicator" to relieve the tension.

TOPICS of the DAY

The Forgotten Ones Again

DURING the last year or two—in fact, since serious rearmament began—the few hundred "A" and "B" licensed civil pilots with a fair to considerable flying experience have been quietly wondering how to set about the business of making themselves useful in and for an emergency. Several times during the last twelve months I have mentioned the case of the experienced "A" licensed pilots, but it must be agreed that it is very difficult to see what the Air Ministry could have usefully done about them. Either one is in the Royal Air Force or not—and the Service has, so far, had very little use for civilian-trained pilots.

Nevertheless, as I have also said before, none of these pilots has felt justified in seriously joining any other branch of national service, whether military or otherwise, and at the time of writing, as before, they are merely waiting to know what they will be called upon to do. The private owners are likely to be co-opted, and they (unless of obvious military age), with their machines, will be used for incidental communication work.

TEMPORARY EQUIPMENT: The prototype D.H.95 on the tarmac at Guernsey airport. This machine will shortly be replaced by a production type, three of which have been ordered by Jersey Airways.

In the present circumstances (on Monday, August 28) it would certainly help the amateurs if the Air Ministry would make some kind of statement about the uses to which reasonable experience is likely to be put. Those who are under the present Service maximum age limit can easily make up their own minds—I am speaking of the class of amateur with upwards of 200 hours' experience and of an age between, say, 30 and 40, or over, in many cases.

A little time ago it was rumoured that those C.A.G. members who had more than so many hours' flying and a certain amount of twin-engine experience would shortly be eligible to take a month's conversion course on bigger military machines in order that their services could be utilised for ferry work. Whether there are more than a dozen C.A.G. members with the necessary qualifications I very much doubt, but the statement, suggestion, or offer I have in mind might be on much the same lines, and would clarify the position for a large number of people. Perhaps by the time you read this the position will be even too clear.

Twins for Training

IT is, perhaps, a little late in the day to mention the matter, but it has always seemed to me that the clubs might usefully have given a certain amount of twin-engine training at C.A.G., or special rates. Naturally, unless the rates were to be exceptionally high, it would have been necessary for the Air Ministry to offer some form of additional aid for such training. If it could have been done, the scheme would not only have been useful to trainees, but also to the light aircraft industry. One or two makers could, if given the necessary promise of support, produce useful and interesting little twins which would, at the same time, have a small private sale.

Actually, there are very few light twin-engine machines on the market anywhere, and the only one in the category of which I am thinking is (or was) the Hordern-Richmond Autoplane. This is still flying about, and there was some chance a year or two ago that it might have been put into production. At the time, however, there was no such thing as a C.A.G. scheme, and only one or two of the clubs showed any serious interest in it.

The Hordern-Richmond, as a type, is rather smaller than that which I visualise. To be really useful, a twin-engined machine would need to be either a two- or three-seater with a very ample luggage capacity and a payload which would allow the carriage of such items as two-way D/F or homing radio and full night-flying equipment.

Incidentally, several of the twins at least would be bought for night-flying practice. Not only are there quite a number of prospective "B" licensees coming along all the time, but there is nowadays an increasing number of pilots who wish, either with "A" or "B" licences, to do Army Co-operation work by day and by night. If this work is carried out by night, both the Air Ministry and the insurance companies demand a certain minimum night-flying experience, and this is difficult to obtain unless the pilots concerned are already in the Volunteer Reserve.

A machine on the lines I suggest would have two engines of anything from 50 to 90 h.p. and should be almost as economical in operation as the ordinary full-sized light aeroplane. If, in the course of design, full use were made of present-day knowledge of slots and flaps, it could have a useful performance range without the immediate necessity for geared engines or v.p. airscrews. The last two will certainly arrive, in time, for all types.

One or two comparatively wealthy and up-to-date clubs have tried the experiment of making use of somewhat larger twin-engined machines, but, at the rates which necessarily have to be charged, the support, both for instruction and solo flying, has been somewhat limited. After all, a five- or six-seater machine with a total power of 260 h.p. is not cheap to run, and, without a special subsidy, could not possibly be hired at much less than £5 an hour.

A few years ago it seemed that several of the more "advanced" private owners had taken to the idea of buying twin-engined machines, but this momentary interest has now faded out. The reason was partly that the available types were not really suitable for the job, partly that they were too expensive both in initial cost and to keep, and partly that, to make use of such a machine, it is necessary to carry a trained crew—or to train oneself. Radio telegraphy is a job for the professional, and radio telephony is not much use outside this country.

Tyranny

BY the way, the C.A.G. scheme and the demand for co-operation work have certainly helped to knock the bottom out of the private-owner market. There has been such a shortage of aeroplanes that good prices have been offered for them, and several of the few remaining private owners have been tempted to sell their machines. While awaiting events they have not bothered to buy new ones.

At the same time, several clubs have, so to speak, put

the screw on their private-owner members in order to make sure that they were able to buy their aircraft. The screw, in one case to my knowledge, took the form of a refusal to assist in any way. The unfortunate owners' machines were never washed, never maintained, and sometimes actively neglected.

In this particular case there was no other aerodrome within reasonable distance of the centre concerned, and the owners gradually became more and more apathetic and finally gave way to the dictatorship. When all this trouble is over and international flying is a little less complicated, private ownership may come back into its own.

False Economy

EARLIER this year I complained about the fact that some clubs were running their C.A.G. section in a very get-rich-quick manner. Not only were they using machines which were too easy and safe to make good basic trainers, but were also sending pupils off with too little dual and then rushing them through their tests. Once the "A" licences were obtained the unfortunate members would be virtually ignored until the time came round for a renewal.

Perhaps the most serious training omission has been in the matter of spins. Admittedly, some of the otherwise perfectly good aeroplanes which are used for training only have a C. of A. in the non-aerobatic category. These, therefore, cannot be legally spun, and I am afraid that the only alternative is to re-equip with more useful aeroplanes. After all, the scheme may eventually be a magnificent device for getting a great many people into the air and for encouraging ordinary people to treat flying (and private flying, in particular) as a normal thing, but the primary reason for the existence of the C.A.G. is to train a large number of people for possible military or quasi-military duties.

In other words, the Air Ministry's only justification to the Treasury has been that the system provides basic training—thus saving a few weeks in case of emergency—at a far lower cost than would otherwise be possible. In such circumstances the training type which cannot be spun or made to do aerobatics cannot really be used quite fairly by clubs obtaining a subsidy for their training work.

A more serious matter is that the pupils who are trained in such machines can never know how to recover from a spin—and even the best machines can, in certain loading conditions, be made to enter one. Those who sometimes spin a machine for their own amusement have become so accustomed to the sensation and the movements of recovery that the latter rather become second nature. But most pilots will remember that extraordinary feeling of helplessness on the first occasion when they were asked to watch, learn, and afterwards repeat. I know that the words of my instructor explaining a spin and the methods of recovery were just so much meaningless shouting. I learnt to recover by trial and error—and a lot of hard thinking. The instructor's explanation meant nothing.

INDICATOR.

FROM the CLUBS and SCHOOLS

PLYMOUTH.

ONE hundred and thirteen hours were flown during the week ended August 21. Messrs. H. B. Jones, R. D. White, C. Strickland, H. D. Hill and A. M. Nartin went solo.

WESTON.

High winds and thunderstorms rendered three days impossible for flying but 103 hr. were recorded. On August 19 an "adopted" squadron from Boscombe Down visited the town.

WITNEY AND OXFORD.

During the week ended August 26 a total of 59 hr. 40 min. was recorded. Messrs. H. Waldron, F. W. Taylor and H. West made their first solo flights.

HANWORTH.

C.A.G. and club members logged 135 hr. during the week ended August 25. Messrs. D. Patient, V. G. Strickland, L. V. Strickland, W. Edmonds and W. G. Divey went solo.

MARSHALLS'.

The flying time for the week ended August 26 amounted to 72 hr. 55 min. Messrs. Hodge, S. M. Bannister and J. Hounslow, of the C.A.G. section, made their first solo flights.

LINCOLNSHIRE.

In the C.A.G. section of the club 65 hr. were recorded. Flying was only possible on four days during the week ended August 26 as there was a considerable amount of sea mist.

IPSWICH.

Good weather during the week ended August 21 resulted in 147 hr. being recorded. Messrs. C. E. Cory, W. A. C. Bond, L. E. Hyde-Parker, J. A. Newstead, H. J. Stevenson and G. W. Dalton went solo.

BEDFORD.

Better weather is bringing flying time back to normal and during the week ended August 26. Messrs. K. F. Jolly, G. Warwick, L.W. Hagell, H. Criswell, L. H. Battams and W. A. Edwards went solo.

EXETER.

Short thunderstorms during the week ended August 21 did little to prevent flying and 148 hr. were logged. Miss H. Harmer, Miss A. Shillitoe and Messrs. D. E. Taylor, W. J. Edwards, N. W. Chambers, W. L. Chapman-Andrews, L. C. Sprague and D. B. Allison made their first solo flights.

THANET.

In spite of two and a half days of high wind an excellent total of 187 hr. were flown. Messrs. J. S. Adam, J. C. Houghton, L. H. Taylor and D. Midgely went solo.

INVERNESS.

During the week ended August 21 a total of 23 hr. were flown. Mr. W. Hutchinson made his first solo flight.

HORTON KIRBY.

Owing to the very bad weather conditions only 132 hr. 50 min. were flown during the week ended August 25. Messrs. E. A. Simcock, A. Clayton, C. A. Brackpool, R. E. Coleman, R. J. Neville and J. R. Hazelton completed their first solo flights.

BRISTOL AND WESSEX.

For the fortnight ended August 25 a total of 140 hr. 10 min. was recorded. Mr. A. C. Wood has joined the club. Mr. C. S. Hole went solo.

C.A.S.C.

During the week ended August 27 members flew a total of 32 hr. 15 min. at Cambridge. Cross-country flights were made to Southend, Ipswich and Sywell. Two new members have joined the club.

CINQUE PORTS.

A total of 76 hr. was recorded during the week ended August 26. First solos were flown by Messrs. K. Smith, R. P. Cue and C. W. Wright. It is the intention of the club to carry on with the organisation of the Cinque Ports Wakefield Cup Race to be flown on Saturday, September 16.

LONDON.

The flying time for the week ended August 26 amounted to 151 hr. 5 min. Mrs. B. Hornsby, Messrs. J. A. Orme and G. Wilshere made their first solo flights. New members are Messrs. R. H. Grattan-Doyle, T. C. Wallace and Flt. Lt. Campbell Orde.

The flying time for the week ended August 18 amounted to 251 hr. Messrs. W. R. Bradford and C. Kenny made their first solo flights.

Gliding at Oxford

SINCE the manufacture of the Drone at Hanworth was discontinued, Mr. Robert Kronfeld has been chief instructor at the Oxford University and City Gliding Club, and manager of the holding company concerned. He joined the club in the spring of last year in order to "help out," and has done so ever since.

The club's site at Aston Rowant is interesting partly because it has for a long time been a private landing ground for the Lambert Arms Hotel, and partly because it is, we believe, the only site near London which permits hill soaring to be carried out in any wind between north-east, south-east and south-west. The field is on the main London-Oxford road, some fifteen miles from Oxford. The club is using a new instructional method which Mr. Kronfield developed from his experience gained when teaching Drone-flying.

MOTH MINOR WEEK-END

Thoughts After a Dozen Hours in the New D.H. Lightweight: The Machine from the Private Owner's Point of View.

THE Moth Minor is essentially a machine for reasonably fast travelling from here to there. The fact that it is also stressed for, and capable of, aerobatics is useful for those who intend to use it for training purposes, and a distinct comfort to the ordinary person. Every machine, after all, should be strong enough for that sort of thing, since far greater loads can sometimes be applied by accident, in the course of normal flying, than deliberately in the execution of aerobatics—other than those of a violently inverted character.

Consequently, when I was able to borrow an example for a few days, I treated the machine as it might be treated by a normal private owner, and devoted only an hour or two to mildly aerobatic experimentation. In the course of the first hour or so of one's experience with a new machine, all manner of little doubts obtrude—depending on the characteristics of the type to which one has previously become accustomed—and quite five or six hours of experience are necessary before any machine can be assessed at its true value. Hence the fact that I simply cruised about for most of the period.

During the dozen hours or so which I spent with the Minor it was taken into and out of very large and small aerodromes, out of good weather and into very bad weather, and in and out of very small hangars. Treated as an all-weather conveyance the machine can be given full marks. It has its faults, but these are the almost inevitable result of compromise both in the matter of general layout and price. The Minor had to be designed to suit everybody, and it had, partly for this reason, to be produced at as low a cost price as possible. It is practicable to build a machine which is both pleasant to fly over long distances and good in vigorous flying qualities, but it is not practicable to offer these two features, at the same time, with easy and fool proof flying characteristics (for *ab initio* training) and at first and later cost figures which will suit everybody.

Perfect View

The Minor is most exceptionally easy to fly and to land, and provides the pilot, who flies the machine from the front seat, with the sort of all-round view which is so essential in these days of crowded skies. In fact, I made one 200-mile trip in weather conditions which I should not like to have faced with more than one other type. In cruising attitude you can look over the nose and more or less straight down over each side. Only a very small area immediately below and ahead is masked, and conditions are made even more easy for the pilot by the fact that no goggles need be worn even when rain is falling quite heavily. The only front seat discomfort is caused by a draught which enters the rear cockpit and hits one in the small of the back; this could be obviated by the use of canvas bags for the instructor's or passenger's feet and legs.

On long cross-country journeys the machine can be held straight and level either by the rudder or the control column alone, and it is pleasant to have one's hands free for map handling (the big tray below the dashboard is very useful for carrying such items where they can conveniently be reached) or, alternatively, to give one's legs a rest.

The Minor probably turns more easily and more accurately on its ailerons than any other type, and it will, on the other hand, take up the correct bank without too much nose-dropping when being turned, at least through a few degrees, on the rudder alone. The particular machine which I flew tended to turn a little to the right at the correct cruising revolutions (2,050 r.p.m. for 100 m.p.h. indicated at near-ground level), but when flying on the control column alone it was only necessary to keep the left wing down a few degrees in order to keep the machine quite straight. One-up, this particular Minor had a very slow-rhythm pitching motion through a few degrees when flown hands-off, but with a passenger in the rear seat it was absolutely stable fore and aft. In very bumpy weather the Minor, like the majority of wide-span, low-wing monoplanes, tended to wallow, but the movements were inconsiderable and the machine could quite happily be left to itself. Because of the necessarily strong trimming adjustment spring, the fore and aft control is somewhat heavy in comparison with the other two. It is, in fact, necessary to make use of the cheese-cutter if a particular attitude is to be held for any length of time. Incidentally, the instructor's control column does not really give him sufficient leverage to counter any wild effort by a pupil.

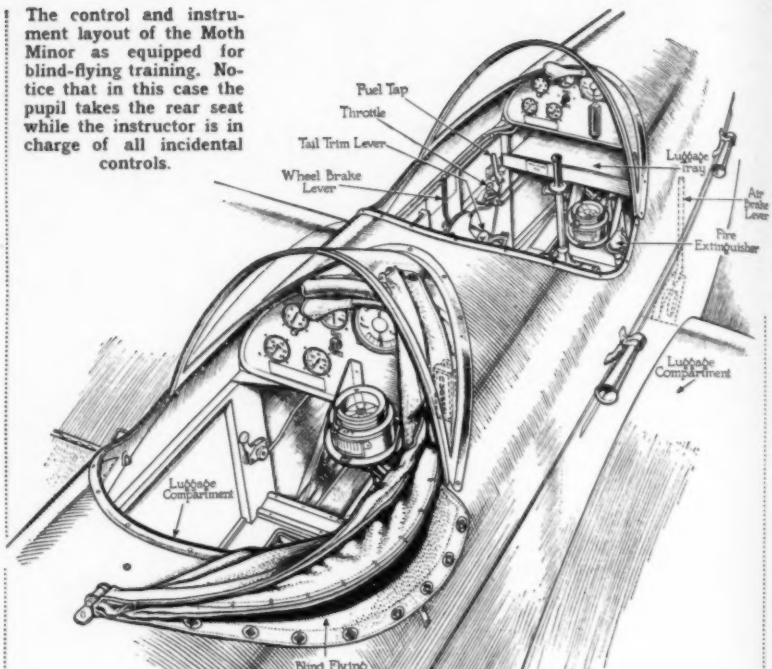
The landing is absurdly easy, though to make a really good three-pointer it is necessary to ease the control column right back and, consequently, landings must still be learnt by the pupil. So there is nothing "too easy" about it from the instructional point of view. On the other hand, a violent wheeler produces no very sudden reactions unless the control column is pulled straight back at the moment of impact, and when the machine is actually pushed on to the wheels with the control column held neutral it still stays on the ground. The undercarriage is soft and will take any normally heavy landing without jar.

Coming In

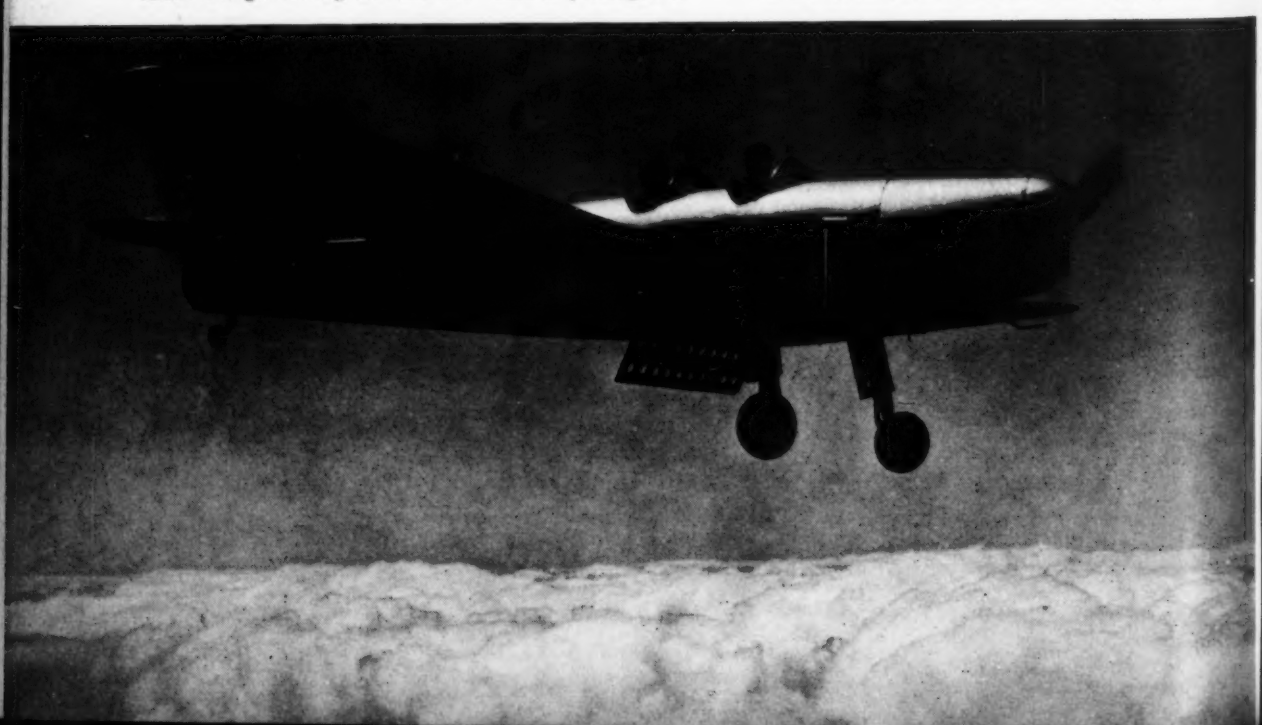
Depending on wind conditions, the approach can be safely made at any speed down to 50 m.p.h., and the angle adjusted quickly by means of the air brake. This latter is not too potent to worry the novice, but sufficiently so to make engine-less approaches very easy. There is little or no sink, though some change of trim, when the brakes are moved to the "up" position, while take-off and climb are only slightly delayed if they are left on accidentally. Further approach adjustment can, if necessary, be provided by applying the usual low-wing slip technique—which involves full rudder in one direction, enough aileron to prevent turning, and a little backward elevator to hold the nose up. Long-period slips can be held at 60 m.p.h. or less by this method. Towards the end of the landing run it is necessary to hold the machine straight rather carefully by using full braking rudder movement. At about 10 m.p.h. the machine may start to swing and, because of the forward position of the undercarriage, this swing cannot be checked once it is seriously under way. In high-speed taxying there is no similar difficulty, apparently because the slipstream gives additional rudder control, and, in twenty landings or so, the swing only became apparent twice—and then at a safely low speed.

A fair amount of left rudder must be applied to keep the Minor straight during the take-off. This is prolonged in time rather than in distance, since the initial acceleration is somewhat slow. Although a few yards may be gained by getting the tail up quickly and helping the machine off as soon as flying speed has been reached, the Minor takes off quite satisfactorily if the control column is simply left in the neutral position with the tail-trimmer one-third forward. To compensate for a run which is on the long side (though additional load appears to make little or no difference), the climb is excellent from the very start, and is almost equal to that of the Tiger Moth. Even when flying out of very small fields this is the really important thing. The climb can be started as soon as the wheels are off the ground.

The control and instrument layout of the Moth Minor as equipped for blind-flying training. Notice that in this case the pupil takes the rear seat while the instructor is in charge of all incidental controls.



(Below) The air-brake usefully steepens the approach, but is not too effective for *ab initio* training purposes.



(Right) **An unusual view of the Minor, showing its distinctive plan form.**

Apparently, with two up, the Minor spins normally and will recover either with centralisation or with opposite rudder. I tried hard to make it spin when flying solo, and produced only a kind of semi-stalled spiral, from which the machine recovered immediately the control column was allowed to move forward again. The manœuvre was not in any way a spin, since the airspeed indicator was showing 80 or 90 m.p.h.

At least when in a similar loading condition, the Minor can be held up at the stall indefinitely without any untoward effect unless the rudder is pressed over one way or another and firmly held there. The nose does not drop and any lateral displacements can be corrected by small rudder movements. Neither wing "drops"—the machine merely wallows gently. The Minor is so safe that, unless a passenger and heavy luggage were being carried, I should have no qualms, when necessary, about bringing it into a small field at 45-50 m.p.h.

Aerobatics

Loops are normal, and it is fairly easy to keep the machine both straight and laterally level while going over. As very much of an aerobatic amateur, I can say little about more advanced manœuvres; I made one slow roll from an initial speed of about 130 m.p.h., and there seemed to be ample rudder to keep the machine straight; the tail-trimmer should be moved forward, otherwise holding the nose up is hard work when inverted.

The Moth Minor has already been described—in *Flight* of June 29 this year—so there should be no need to explain the luggage, fuel and oil arrangements. Apart from the space left in the wing stub when no extra tank is fitted, there are quite large luggage compartments both behind the rear seat and below the dashboard in the front cockpit. Normal-sized suitcases will go into either, but it might be a good thing if the makers provided a special case or cases which exactly fitted the rear compartment. The stub wing luggage compartment strikes one as being only of incidental use, since the standard extra tank would surely be fitted by any owner who was flying so far afield that all three luggage spaces were required. With this extra tank the range is very adequate indeed—a total of about 26 gallons being carried for an engine using only 4½ gallons an hour, or less. Each tank has a clearly visible dial-type gauge.

The wing-folding arrangements are simple and robust. Two people are required for the operation, but this can be carried out in less than two minutes once the movements are properly understood. It is only necessary to lift the flap, release the locking pins, and attach the wing tip to the tailplane on each side. H. A. T.

Hughes Prepares

A CORRESPONDENT in America writes that the Boeing Stratoliner in which Mr. Howard Hughes plans shortly to fly to Paris (and possibly farther) is tucked away in Hughes' hangar at the Grand Central Air Terminal, Los Angeles, dwarfing the Lockheed 14 in which he flew round the world. It is possible that the engines are two-row Wrights of 1,500 h.p., although it was originally believed that they would be two-speed supercharged nine-cylinder Cyclones of about 1,100 h.p. Unfortunately, "Positively No Admittance" notices prevent closer examination.

One-class Competition

WITH the idea of starting all the competitors, so to speak, from zero, only one type of machine was permitted for this year's aerobatic contests at Frankfurt. Each selected pilot had a Bücker Jungmeister at his disposal for a month before the event; of the eighty entrants only twenty-two were finally admitted to the competition. This was won by Herr Oberfeldwebel Falderbaum, who was third last year. The runner-up was Lt. Eckerle de Wien. Unfortunately, Graf Hagenburg, who is one of the best-known German aerobatic pilot, since he takes part in a number of international competitions, was not able to enter.

Radio Rearrangements in India

SINCE the seaplane route across India is considerably different from that previously used by landplanes, it has been necessary to provide new radio stations between Karachi and Allahabad. In this case the landplane route is via Jodhpur and Delhi, while the flying boat route is via Udaipur (Rajsamand Lake) and Gwalior (Madho Sagar Lake) and new radio stations have had to be provided at these points. Temporary stations were laid out in 1938, but only this month has the first permanent station at Gwalior been completed. This has medium- as well as short-wave two-way equipment, with Marconi-Adcock DIF. The short wave-lengths will be used mainly for inter-aerodrome communications and for the collection and distribution of meteorological information from Poona, where the Indian Meteorological Department has its headquarters.

In the future the forecasting section of the Department will be shifted from Agra to Delhi. Thirty-four upper air observation points, from which pilot balloons are regularly released, are scattered over India, and it is felt that Delhi will now be a more satisfactory centre for the main observatory.

Rally at Romford

ON Sunday, September 17, an "All-Women's Air Rally" is being held at Maylands Aerodrome, Romford, by the National Women's Air Reserve. There will be prizes for the pilot coming the longest distance, for the winners of the arrival competition, for those of the C.A.G. landing competition, and for the owner or pilot of the best-kept machine, age and hours considered. Additionally a three-lap race over a four-mile circuit will be held for women instructors.

Duration Record

THE official time for the sustained refuelling endurance record which was recently established by two American pilots, flying a Lycoming-engined Taylorcraft, has now been issued. Messrs. Humphrey and Hunter Moody actually broke the previous light aircraft endurance record, of 218 hr. 43 min., by a decisive margin of 125 hr. 3 min.

They were in the air for a total of 343 hr. 46 min., and only came down in the end because of the approach of a very severe electrical storm. Probably they felt that after so much continuous flying the machine might not be in a condition to stand the loads which were likely to be imposed. In any case, with the record so handsomely broken, the risk involved in flying completely blind in such conditions was not justified.

THE ROYAL AERO CLUB

News and Official Notices for *the Week Ended August 26*

The King's Cup Race

THE Airport Committee of the Birmingham Corporation, at a meeting at the Airport of Birmingham on Friday, decided, after consultation with the Royal Aero Club, that the King's Cup air race and the Wakefield Challenge Trophy air race, due to be flown at the airport of Birmingham on September 2, should not take place.

R.A.F. Volunteer Reserve

A WORD of praise in the way the staffs of light aeroplane clubs have responded to the call for R.A.F. Volunteer Reservists is given by Captain Harold Balfour, Under-Secretary of State for Air, in a letter to Sir W. Lindsay Everard, Chairman of the Royal Aero Club and of the General Council of Light Aeroplane Clubs. Captain Balfour says that he is most gratified to learn that a high proportion of flying instructors, ground engineers, and other staff of the clubs have agreed to undertake reserve liabilities under an arrangement whereby they may, subject to a test of proficiency, be exempted from Reserve training in peace time. Captain Balfour concludes: "I should be grateful if you could convey to the clubs my appreciation of the spirit which has been shown by their staffs."

Swedish Flying Reserve

THE Swedish Air Force will arrange a flying display in which about 100 aeroplanes will take part during the Jubilee Flying Meeting of the Aero Club of Scania on September 8-10 at Malmö-Bulltofta. This is the tenth time the meeting has been held and invitations have been issued to the members of the Royal Aero Club. There is to be an arrival competition, and a distance and landing competition. On the evening of Sunday, September 10, there will be a banquet, attended by the ladies, at the Savoy Hotel, Malmö. All competitors are to be the guests of the Aero-Klubben i Skåne.

Aviators' Certificates

No.	Name	Club or School	Date
19,573	Christopher George Furby	York and Leeming F.C.	16.8.39
19,574	Sydney McKenzie Thomson	Southend Flying Club	16.8.39
19,575	Henry David Marks	Southend Flying Club	16.8.39
19,576	Thomas Graham Peacock	Liverpool and Dist. Ae. C.	16.8.39
19,577	Thomas John Thomas	Witney and Oxford Ae. C.	16.8.39
19,578	Charles Gordon Lambert	Midland Aero Club	16.8.39
19,579	Robert Gore	Midland Aero Club	16.8.39
19,580	Maurice Herbert Pinder	Bedford Aero Club	16.8.39
19,581	Frank Oswald Dimblebee	County Flying Club	16.8.39
19,582	Jack Copping	County Flying Club	16.8.39
19,583	Horace Busby	County Flying Club	16.8.39
19,584	Henry Gunpei Pennick	County Flying Club	16.8.39
19,585	John Henry Shaw	Wiltshire Flying Club	16.8.39
19,586	Trevor George Prytherch	Autogiro Flying Club	16.8.39
19,587	Arthur Edward Chapman	Cotswold Aero Club	16.8.39
19,588	William Arthur Jordan	Cotswold Aero Club	16.8.39
19,589	Alexander Charles Arthur Harding	Exeter Aero Club	16.8.39
19,590	Wilfred Johnson	Malling Aero Club	16.8.39
19,591	Jesse Humphrey Kingsbury	Malling Aero Club	16.8.39
19,592	Stella Joyce Petersen	Romford Flying Club	16.8.39
19,593	Sydney Francis Broome	Sheffield Aero Club	16.8.39
19,594	Charles Meredith Annan	Scottish Flying Club	16.8.39
19,595	Bertram Frederick Kilian	Herts and Essex Ae. C.	16.8.39
19,596	David Marcourt Mellows	Herts and Essex Ae. C.	16.8.39
19,597	Arthur Stanley Anson	Herts and Essex Ae. C.	16.8.39
19,598	Evelyn Mary Gwillim	Herts and Essex Ae. C.	16.8.39
19,599	Frederick Arthur Pannell	Lincolnshire Aero Club	16.8.39
19,600	Hindley Kidd Reed	Lincolnshire Aero Club	16.8.39
19,601	Charles Hornsby Taylor	Northern Aviation Club	17.8.39
19,602	Edward John Davies	Northern Aviation Club	17.8.39
19,603	Edward Cossar	Scottish Flying Club	17.8.39
19,604	Ian Linder	Herts and Essex Ae. C.	17.8.39
19,605	Arthur Thomas Grinter	Wiltshire Flying Club	17.8.39
19,606	Harold Clyde Loveless	Norfolk and Norwich Ae.C.	17.8.39
19,607	Gerald Oke Manning	Portsmouth Aero Club	17.8.39
19,608	Eric William Brookhouse	North Staffs Aero Club	17.8.39
19,609	John Anthony Vicary Moira	Bristol and Wessex Ae. C.	17.8.39
19,610	George Fine	Thanet Aero Club	17.8.39
19,611	Edmund Drew	Plymouth and Dist. Ae. C.	17.8.39
19,612	Jack Claxton	Thanet Aero Club	17.8.39
19,613	Raymond Harold Eric James	Thanet Aero Club	17.8.39
19,614	Bert John Denham	Thanet Aero Club	17.8.39
19,615	Edward Montgomery Robinson	London Air Park F.C.	17.8.39
19,616	Leslie Thomas Clark	London Air Park F.C.	17.8.39
19,617	George William John Hicks	London Air Park F.C.	17.8.39
19,618	Geoffrey Louis McInerny	London Air Park F.C.	17.8.39
19,619	John Walter Chubb	Luton Flying Club	17.8.39
19,620	Thomas Ian Samuel Eeley	Luton Flying Club	17.8.39
19,621	Francis Henry Douglas Lock	Bournemouth Flying Club	17.8.39
19,622	Alfred Richard Grindley	Bournemouth Flying Club	17.8.39
19,623	Clifford Henry Jacka	Bournemouth Flying Club	17.8.39
19,624	Jack Buckley	Bournemouth Flying Club	17.8.39
19,625	Ronald Vivian	Bournemouth Flying Club	17.8.39
19,626	John Collins	Exeter Aero Club	17.8.39
19,627	William Townsend Daniel	Exeter Aero Club	17.8.39
19,628	Kenneth Rawson Collins	Exeter Aero Club	17.8.39
19,629	Richard Neville Calcraft	Eastbourne Flying Club	18.8.39
19,630	Ralph Charles Webster	London Aeroplane Club	18.8.39
19,631	Ronald Martin	London Aeroplane Club	18.8.39
19,632	Anthony David Scott-Martin	Insurance Flying Club	18.8.39
19,633	Ernest Albert Luks	Insurance Flying Club	18.8.39
19,634	Harold Henry Warwick	Bedford Aero Club	18.8.39
19,635	John Henry Raven Ratcliff	Bedford Aero Club	18.8.39
19,636	Eric Rendall	Hull Aero Club	18.8.39
19,637	Leslie Herbert Major	Hull Aero Club	18.8.39
19,638	Lionel Edward Leavy	Hull Aero Club	18.8.39
19,639	George William Cowling	Lincolnshire Aero Club	18.8.39
19,640	Kenneth Eric Bouskill	Isle of Wight Flying Club	18.8.39
19,641	John Barrington Barrett	Isle of Wight Flying Club	18.8.39
19,642	Gerald Kingsmill Annesley Brown-rigg.	Isle of Wight Flying Club	18.8.39
19,643	Barbara Whitehead	Lancashire Aero Club	18.8.39
19,644	Emily Alberta Emery	Weston Aero Club	18.8.39
19,645	Will Lawrance Brockie Wright	Scottish Flying Club	18.8.39
19,646	Alexander William Ogston	Strathtay Aero Club	18.8.39
19,647	Frank Alfred Black	Herts and Essex Ae. C.	18.8.39
19,648	William Daniels	Herts and Essex Ae. C.	18.8.39
19,649	Arthur Charles Geary	Herts and Essex Ae. C.	18.8.39
19,650	Charles Trevithick Amery Luke	Herts and Essex Ae. C.	18.8.39
19,651	Arthur Leonard Judge	Herts and Essex Ae. C.	18.8.39
19,652	Donald Arthur Truscott	London Air Park F.C.	19.8.39
19,653	William Frederick John White	London Air Park F.C.	19.8.39
19,654	Raymond Ernest Wigg	London Air Park F.C.	19.8.39
19,655	George Stevenson Marsh	London Air Park F.C.	19.8.39
19,656	William Edwin Thorpe	London Air Park F.C.	19.8.39
19,657	John Thomas Bracey	Romford Flying Club	19.8.39
19,658	Horace Winston Palmer	South Coast Flying Club	19.8.39
19,659	Margaret Olive Frost	South Coast Flying Club	19.8.39
19,660	John Stafford Gowland	South Coast Flying Club	19.8.39
19,661	William Edward Laceby	South Coast Flying Club	19.8.39
19,662	Henry Seymour Theyer	South Coast Flying Club	19.8.39
19,663	Albert Thomas Sword-Daniels	South Coast Flying Club	19.8.39
19,664	Arthur Patrick Smallman	South Coast Flying Club	19.8.39
19,665	Gordon Cuthbert Smith	Malling Aero Club	19.8.39
19,666	Herbert Jack Jauncey	Malling Aero Club	19.8.39
19,667	George William Fenton	Lancashire Aero Club	19.8.39
19,668	Edward Ronald Bousfield	Liverpool and Dist. Ae. C.	19.8.39
19,669	Norman Rutland Thompson	Wiltshire Flying Club	19.8.39
19,670	John Dennis Kuipers	Liverpool and Dist. Ae. C.	19.8.39
19,671	Frederick William Walby Wilson	Liverpool and Dist. Ae. C.	19.8.39
19,672	John Victor Bishop Dow	Liverpool and Dist. Ae. C.	19.8.39
19,673	Christopher Richmond Whytt	Exeter Aero Club	19.8.39

Forthcoming Events

SEPTEMBER.

Sun., 3rd. Gordon Bennett Balloon Race, Poland.
Sat., 9th-Mon., 11th. La Baule Rally.
Fri., 8th-Sun., 10th. Aero Club of Scania (Sweden): Rally.
Sat., 16th. Cinque Ports Flying Club: Wakefield Cup Race.
Sat., 23rd. Cardiff Aeroplane Club: London-Cardiff Race.

OCTOBER.

Sun., 1st. Aero Club de France: Coupe Deutsch de la Meurthe, Etampes.
Mon., 2nd-Sun., 17th. Milan Aero Show.

SPOT LANDING: Allen Daily, of Yale, flying a Kitty Hawk (Waco F), wins the forced landing event. The mark, a white cross, is just below the undercarriage.

A previous president of the New England Intercollegiate Flying Clubs, Bill Atterbury, presents the bomb-dropping trophy to one Flynn.

CLUB FLYING in the U.S.A.

A Look-in at New Haven, Conn.

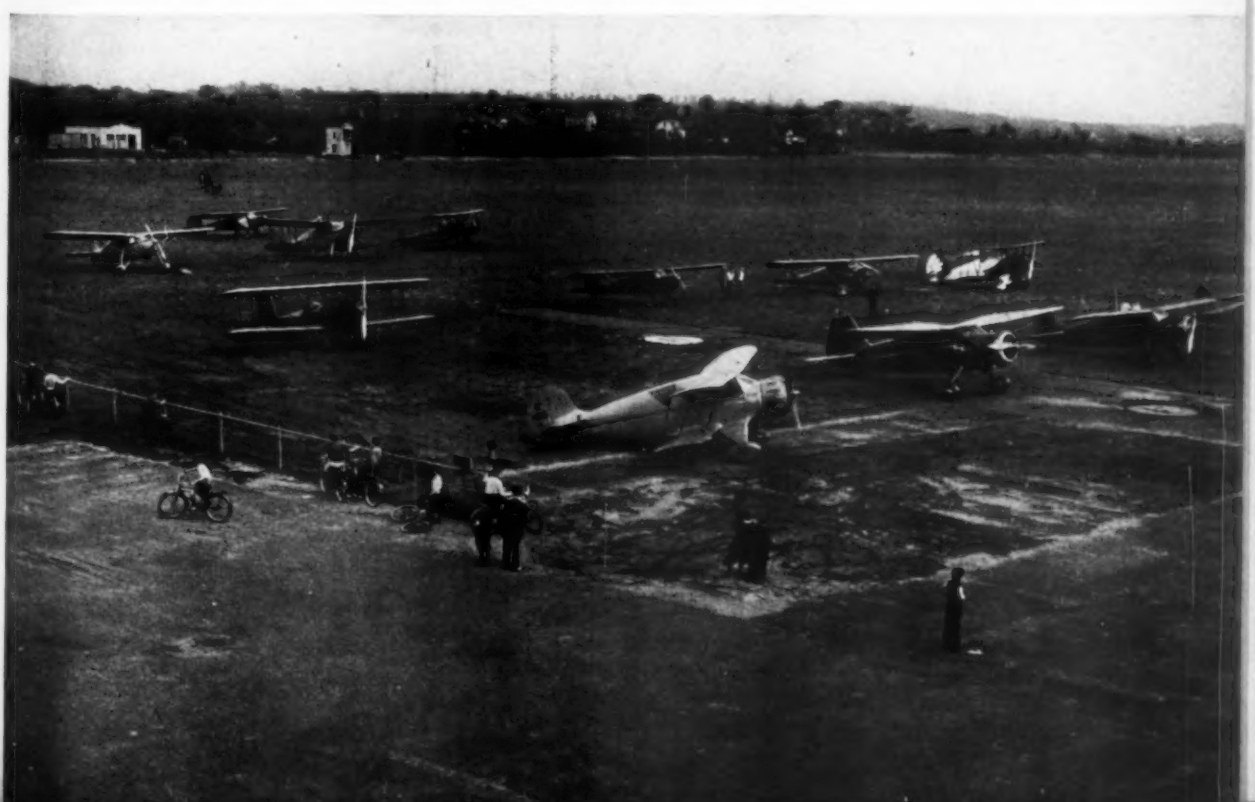
IN reproducing these pictures we quote, without comment, the following description from *Life*:—

"Most popular springtime sports at U.S. colleges have long been baseball, track and crew. On May 20 at New Haven, Conn., a new sport, more thrilling and more dangerous, made its bid for popularity. To the city's enterprising little airport came twenty of the best Eastern-college pilots for the annual air meet of the New England Intercollegiate Flying Clubs. For two days the boys banked and rolled, did desperate split S's and loops. At 100 m.p.h. they cut toilet paper floating in mid-air. They landed to a point and dropped sand bombs at a target. Luckily nobody was killed."

Spectatorial Expressions: Watching the display.

Ready for the "paper-strafing." George Foote takes over before climbing to 2,000ft., releasing the paper and cutting it twice in a 500ft. loss of height.

(Below) The scene at New Haven airport, the centre of the proceedings. This airport is on the edge of Long Island Sound and the airport manager hired machines to the entrants.



RAIDING by CELESTIAL NAVIGATION

Part III: Over Enemy Territory

By FRANCIS CHICHESTER

THIS, the third of a series of special articles by an acknowledged authority on navigation, continues the detailed account of an imaginary bombing raid carried out from a base in England by means of celestial navigation. Mr. Chichester seeks to prove his contention that a formation of bombers can be navigated on a raid of a thousand miles, above cloud the whole time, yet knowing its position to within less than one mile.

His imaginary formation consists of a specially equipped navigational machine leading two heavily laden bombers. Their target is a stronghold where, it is known, the enemy will have its entire high command gathered in conference at a certain hour.

Last week the sea crossing was described, and this week Mr. Chichester deals with the navigational methods by which an approach is made to the target by flying up a Z-shaped estuary.

TO sum up procedure for the next stage, the stars' altitudes are worked out in advance so that the position can be quickly fixed after another hour's run. Gingrich's tables are used. The position fix is obtained shortly before the exact hour and is carried forward the necessary amount so that it can be known at the hour.

During the following hour the route is Z-shaped (see next page) and the D.R. required appears, at first sight, tricky. The distance to the first turn-off point is computed; then the course to fly and the time it will take to reach the turn-off point are worked out, allowing both for the corrected wind and also for the leeway which has built up during the past hour.

The distance and bearing of the *second* turn-off point from the first are then computed. The same wind is allowed for in setting the course, but there is no leeway to make good because the leeway of the past hour has already been allowed for in the first leg of the "Z."

The bearing of the final objective from the second turn-off point is computed; this is the track which must be made good after the second turn-off. The point where the aircraft should be at the exact hour is calculated, still using the same wind. The actual position is fixed by star observations four minutes before the hour. Now occurs the most difficult D.R. problem. During the past fifty-six minutes the aeroplanes have flown on three different courses or legs. They are now off-course a certain amount. How is the wind previously used to be corrected? They must work out where they ought to be after the fifty-six minutes; whereupon the distance between where they *ought to be* and where they *are* represents the change in wind per 56 minutes. This must be converted into so much per hour and then combined with the wind previously used, the corrected wind being used when carrying the 56 minutes' position forward to the hour.

* * *

The altitude and azimuths of Alioth and Capella were precomputed for chosen positions near the point U for 01 00 00 hours G.M.T. by the third assistant using Gingrich tables.*

Alioth. Latitude 47° 00′ N.

01 00 00 hours Sidereal	336° 33½′
S.H.A. or A.V. Alioth	167° 09½′
	503° 43′
Long. West + 360°	372° 43′ —
Local H.A. West	131° 00′

Dec + 56° 17½′

A	6,684	K + 121° 27½′	X .932
B	37,677	K − D = 65° 10′	Y 1.964
A + B	44,361		X + Y = 2.896
a = 21° 6¼′			Az. = N 26.8 W.

Check by Bygrave:

y	=	113° 38′
colat	=	43°
Y	=	156° 38′
A	=	N. 26° 41′ W.
a	=	21° 06′

* The method of computing by Gingrich was as follows:

From Table A, in the column with Hour Angle 131° at the bottom (H.A. being greater than 90°) and opposite the latitude 47° at the side, take out:

A	180° − K	X
0,684.	58° 32.5′,	.932

Subtract 180° − K from 180° to obtain K, and give K the same sign as the Latitude, North.

A	K	X
6,684.	+ 121° 27.5′,	+ .932

Give X the same sign as the latitude.

From the same column for H.A. 131° and opposite the declination + 56° (to nearest degree) at the side, take out Y.

Y = + 1.964

Give Y the same sign as the declination and combine it with X to obtain the Azimuth, which is done by reference to the Azimuth table (3rd table) and in column with heading nearest to X + Y. X + Y = 2.896. Find column headed 2.90, and from this column opposite Latitude 47° at side of page, take the Azimuth 26.8°, which is read from same pole as the larger number Y of X and Y, namely, North, and West because the Hour Angle is West.

Subtract the declination from K (because they are both the same side of the equator)

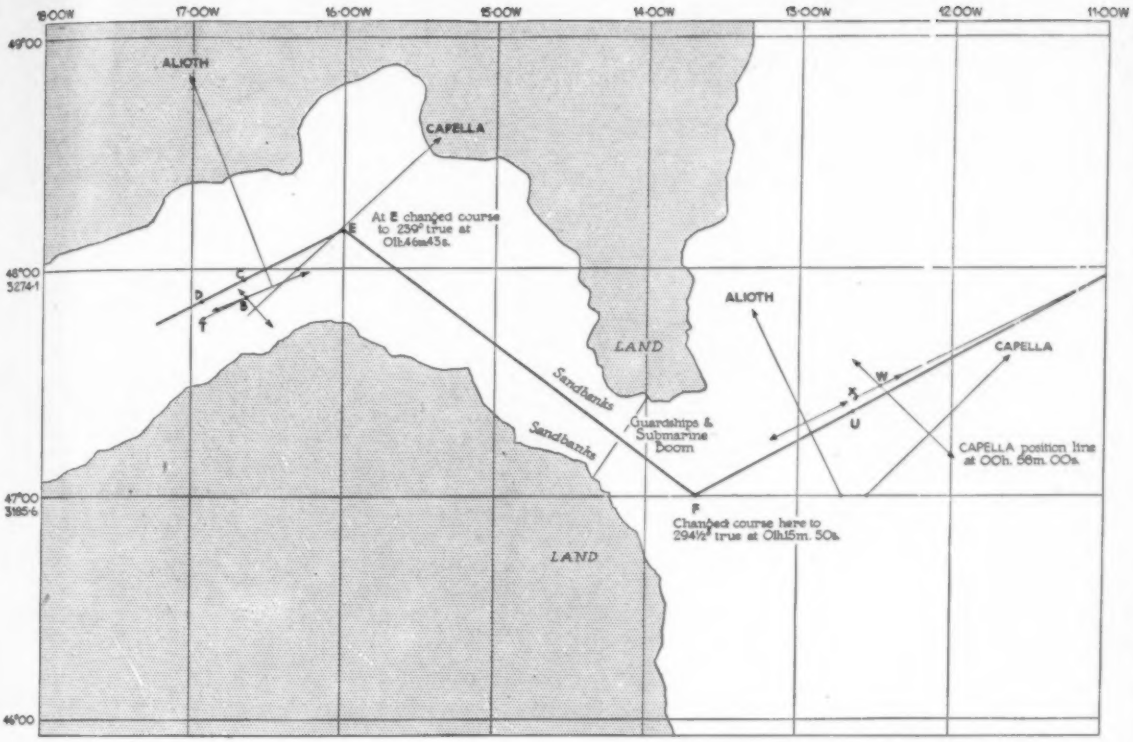
K	+	121° 27.5′
Dec	+	56° 17.5′
K − D =		65° 10′

From Table B, from the column headed 65° and opposite the number of odd minutes (10) at the side of the page, take out the quantity B = 37,677. Add B to A

B	37,677
A	6,684
B + A	44,361

Find this quantity in the same Table B, and read off the altitude, degrees at the bottom of the column and the odd minutes at the side of the page opposite B + A.

Result 21° + 6′ + ¼′ (by interpolation).



C = Expected position at 01h. 56m.
D = Expected position at 02h.
B = Astronomical fix at 01h. 56m. 00.1s.
T = Position at 02h. run up from B position.

E = 48° 10′ N. (3,289.0 mer. parts) 16° 00′ W.
C = 47° 56½′ N. 16° 40½′ W.
B = 47° 52½′ N. 16° 40′⅓ W.
D = 47° 50½′ N. (3,260.0 mer. parts) 16° 57′ W.
T = 47° 46′ N. (3,253.3 mer. parts) 16° 57′ W.

In a similar manner with Latitude 47° N. and Longitude 12° 30½′ W. the altitude and azimuth of Capella were computed :

By Gingrich .. $a = 19° 26'$ Az. = N. 42.5° E.
By Bygrave .. $a = 19° 26'$ Az. = N. 42° 20½′ E.

The observations obtained were as follows :

Capella .. 00 58 00 Altitude 19° 33¼′
Alioth .. 00 57 44 Altitude 21° 36½′

Once again Alioth was so nearly abeam that there was no need to adjust the position line obtained from it for the flight during the interval of 16 seconds between the two star observations.

The Rate of Change for Capella Lat. 47°, Azimuth 42½° was 7′ per minute. Capella's computed altitude at 2m. before 01h. was, therefore, 19° 26′ − 14′ = 19° 12′. Its observed altitude was 19° 33½′ and the position at 00 58 00 G.M.T. was therefore on a line 21½ miles nearer the star than the chosen position.

The Rate of Change for Alioth with Azimuth 26½°, Lat. 47° was 4½′ per minute. The computed altitude of Alioth for 00 57 44 G.M.T. 2¼ minutes earlier than 01 00 00 G.M.T. was therefore 21° 06¾′ + 10′ = 21° 16¾′. The observed altitude was, however, 21° 36¼′ and therefore the position at 00 57 44 was on a line 19½ miles nearer the star than the chosen position. Because the star was abeam the position was on the same line 16 seconds later at 00 58 00 G.M.T.

Where the position lines intercepted at W. was 285.4 mer. parts = 187 miles flight from the point R in 58 minutes. This represented a speed of 193½ knots and the position at 00 01 00 G.M.T. would be 6¼ miles further on at X.

The correct wind during the past hour was not, therefore, 46 knots from 225° but this wind combined with the component UX, which was :

UX = 5 mer. parts = 5 × ⅝ miles = 3⅛ miles.
Direction UX = from 201°

Setting the two wind components 46 knots from 225° and 3⅛ knots from 201° on the Dalton "G," Drake found the true wind during the past hour had been 49 knots from 223°.

W = 47° 28′ N. (mer. parts 3,226.7) 12° 28′ W.
X = 47° 25½′ N. (mer. parts 3,222.8) 12° 36½′ W.
U = 47° 22½′ N. (mer. parts 3,218.4) 12° 38¼′ W.

W = Position by astronomical fix at 00h. 58m. 00s.
X = Position at 01h. run up from astronomical fix.
U = D.R. (expected) position for 01h.

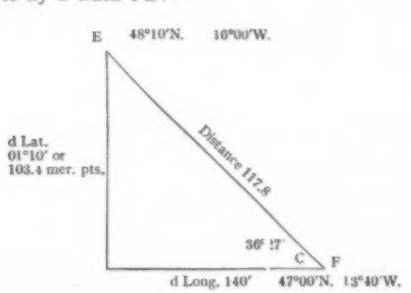
The distance now to fly XF to F, was computed.

Position of—

X	12° 36½′ W.	47° 25½′ N.	Mer. parts 3,222.8
F	13° 40′ W.	47° 00′ N.	Mer. parts 3,185.6
d Long.	64½′	*d* Lat. 25½′	*d* Mer. parts 37.2

$$\tan c = \frac{64\frac{1}{2}}{37.2}$$
$$c = 60° 02'$$
$$\text{Distance} = 25\frac{1}{2} \text{ sec. } 60° 02'$$
$$= 50.7 \text{ miles.}$$

During this flight a wind of 49 knots from 223° must be allowed for. Drake plotted this wind from direction 223° to the centre of the Dalton "G." He set the required track 180° + 60° = 240° at the index ; set the air speed 240 to the beginning of the wind arrow and found that the course to fly was 3° to the left of 240°, namely, 237°, and the ground speed would be 193 knots. He could, therefore, expect to reach F in $\frac{51 \times 60}{193}$ minutes = 15 mins. 51½ secs. His compass course was 237° true + 16° westerly variation + 3° westerly deviation = 256°. On the way to F he computed the required course to fly a track FE :—



Check of distance FE by trigonometry:

Position of—

E, Long. =	16° 00′ W.	Lat. =	48° 10′ N.	Mer. parts	3,289.0
F, Long. =	13° 40′ W.	Lat. =	47° 00′ N.	Mer. parts	3,185.6
d Long.	2° 20′	*d* Lat.	01° 10′	*d* Mer. pts.	103.4

$$\tan c = \frac{d \text{ lat. in mer. parts}}{d \text{ long.}}$$

$$= \frac{103.4}{140}$$

$$c = 36° 27′$$

Distance FE = *d* lat. cosec *c*

= 117.8

Required track = 270 + 36° 27′

= 306° 27′

To find the course to fly to make good the track FE and assuming the same wind of 49 knots from 223°, Drake adjusted the Dalton "G" to bring the track 306½° to the Index. The wind was already plotted on the disc. It was seen that the course to fly was 12° to the left of FE = 306½ − 12 = 294½, and the ground speed would be 229 knots. The compass course set was 294½ + 17½ mag. variation West − 2 deviation East = 310°.

At 01 15 50 G.M.T. he ordered the compass course to be changed to 310°.

The time to cover FE, 117.8 miles, at 229 knots would be 30 mins. 51½ secs., and he therefore gave orders to change course again at 01 46 43 G.M.T., which would bring the raiders on to the last leg of the flight. Meanwhile he had the new course after the turn, and the D.R. position for 02 hours G.M.T. worked out and altitudes of the two stars for 01 55 00 G.M.T. precomputed. Course E to A, the final objective.

Position of—

E, Lat.	48° 10′ N.	Long.	16° 00′ W.	Mer. parts	3,289.0
A, Lat.	45° 00′ N.	Long.	25° 00′ W.	Mer. parts	3,013.4
d Lat.	190′	*d* Long.	540′	*d* Mer. parts	275.6

$$\tan c = \frac{540}{275.6}$$

$$c = 62° 57½′$$

Course = 180° + 62° 58′

= 243°

Distance = 190 sec. 62° 57½′

= 418 miles.

Assuming the same wind of 49 knots from 223°, Drake set this as before on the Dalton "G" and read off it that the course to fly was 239°; the ground speed 193½.

The flight was due at E. at 01 46 43 G.M.T., which was 13m. 17s. short of 02 00 G.M.T. At 02 00 G.M.T., therefore, the flight should be $\frac{13\text{m. }17\text{s.}}{60} \times 193½$ miles along the track EA to objective, i.e. 43 miles. This point was marked D. Then the position of D, 43 miles along a course of 180 + 63° from E was:

By Traverse Table with distance = hypotenuse = 43′, and course = angle 63°, *d* lat. was found to be 19.5 and dep. 38.3

∴ Lat. of D = 48° 10′ − 19.5

= 47° 50.5′

and 38.3′ of departure with mid latitude 48° = 57′ mer. parts or minutes of longitude.

∴ Long. of D = 16° + 57′

= 16° 57′

Position of D 47° 50½′ N. 16° 57′ W.

Drake now had the altitudes of Alioth and Capella computed for chosen positions near D at 01 55 G.M.T. by No. 2 assistant.

The average time of the Capella observations was 01 56 00 and of the Alioth 01 55 40. Alioth was within 6° of dead abeam and therefore the 01 55 40 position line could be used without transferring it for 20 seconds later at 01 56 G.M.T.

The observed altitude of Alioth was 19° 07′, which was 5′ less than the computed altitude 19° 14½′ − 2½′ (decrease since 01 55 G.M.T.) = 19° 12′, and therefore the Alioth position line was 5′ away from the chosen position. The observed altitude of Capella was 24° 47′, which was 16′ less than the observed altitude 24° 55½′ + 7½′ (increase since 01 55 G.M.T.) = 25° 03′, and therefore the Capella position line was 16′ away from the chosen position.

The two position lines intercepted at B, 47° 52½′ N., 16° 40½′ W., and this was therefore the actual position at 01 56 00. The flight at that moment should have been at C, 47° 56½′ N. 16° 40½′ W. four minutes flight from D, and therefore a wind component equal to CB had been setting the flight off course during the past 56 minutes.

To find what the actual position would be at 02 00 G.M.T. it was necessary to plot the track from B, allowing for a wind of 49 knots from 223° combined with the component $\frac{60}{56}$ of CB.

CB = 4 miles from 00°

∴ wind to be allowed for is 49 knots from 223° combined with $\frac{60}{56}$ of 4 from 00° (i.e. 4).

This was done on the Dalton "G" and the resultant wind found to be 46 knots from 226½°; and it was also found that the track during the next 4 minutes would be 242° and the groundspeed 195. At 02.00 G.M.T. the flight would therefore be at T, $\frac{4}{60}$ of 195 miles from B in a direction 242°. $\frac{4}{60}$ of 195 = 13 miles. Position of T, 16° 57′ W., 47° 46′ N. Drake already had the wind worked out, 46 knots from 226½°, and it was only necessary to add a component equal to the distance off course at T. (This distance off course must be recovered during the next hour's flight to get back on to the main course during that time.)

The distance off course was 4 miles from 243° + 90° = 333°.

The plotting was done on the computer and the course to fly was read off 240¾°, ground speed 196 knots.

A point S, 196 miles from T, was then marked on the main course and this was the expected position an hour later at 03 00 hours G.M.T.

The bombers were now drawing near their objective.

(To be continued in an early issue).

NASAL ARCHITECTURE:

A fine aerial study of the nose of a Douglas B18-A bomber (two Wright Cyclones) of the U.S. Army Air Corps. A machine gun is installed in the spherical mounting below the projecting "transparency" which houses the bomb aimer. The bomb traps in the belly of the fuselage are also visible. This type of Douglas is used extensively by America, but even with the two-speed supercharged Cyclones it is believed to be inferior in performance to the Whitley V or Wellington I—which is understandable, as the American type is quite an old adaptation of the DC-2 transport.

COMMERCIAL AVIATION

IN NEW ZEALAND : One of Cook Strait Airways' D.H. Rapides flying on the west coast route between Nelson and Greymouth. The company uses five of these machines and also runs a service between Nelson, Blenheim and Wellington. An additional service from Nelson to Takaka is to be opened in October.

THE WEEK AT CROYDON

Crisis Effects at Croydon : International Atmosphere : A Boom Year Ruined : Rivalry

IT is always difficult to write these notes during a crisis, when ordinary values tend to be obscured.

Somebody from a Scandinavian country told me that the first place in England at which he sensed the crisis mentality was Croydon airport, where tense groups of people, departing hurriedly from this country, were to be seen, and where the air traffic companies were unnaturally busy.

One result of the state of affairs was that Army people in uniform, a rare sight with us, were seen dashing round with lists and removing badly needed members of our traffic staffs. Those in searchlight units, anyway, went early, being told by N.C.O.s to report at once. Imperial Airways, K.L.M. and Air France all lost members of their staff, temporarily, one hopes, in this way, but not, so far as I know, D.L.H. We may be accustomed to police-sergeants remarking, "I want you," but it's a new one on us when an Army sergeant does so.

A certain fuss was made in the newspapers about the cancellation of K.L.M. services owing to partial mobilisation in Holland, which caused pilots, engineers and wireless operators to be called to the colours. Certain services on the Continent were cancelled, it is true, but very little change was made in the services between England and Holland. Two morning services, normally running at 09.00 and 09.15, were combined to run at 09.15, and the night freighter was temporarily suspended.

As a matter of fact, embargoes on the export of a number of commodities had much to do with this suspension. It seems a pity that Customs cannot make up their minds. I refer to the Board of Customs in London—an ancient and honourable institution.

You would say that bullion either could or could not be exported and no question about it. Yet when the embargo on some classes of export goods came into force, a certain company was positively refused permission to load it, and the machine left without it. Shortly afterwards the embargo was lifted. It meant a delay of four hours in the shipment, for no particular reason; and bullion, especially in a time of sharp market fluctuation, should be the last cargo to be treated in this haphazard manner.

One feature of the crisis at airports such as Croydon is the complete absence of nationalistic feeling, everybody, on whatever side he happens to be, carrying on harmoniously as usual. It means, of course, that this war, if it comes, is not to be a war of peoples but of leaders.

I have often remarked (and sundry crises have gone far to prove I am right) that if they would leave these disputes to a committee of mixed air pilots (commercial, of course) of all nationalities—men who know, respect and like each other, and, most of all, rub shoulders all over Europe every day with one another—all these apparently knotty questions would be settled over a mug of beer.

Aviation is the only genuinely international business there is, and what do politicians know of each other and of each other's countries in comparison with airline pilots?

A thoroughly international outlook in the air business, by the way, saved the K.L.M. from suffering a good deal during this particular crisis. That airline company, whilst basically Dutch and proud of it, does not bother too much about a man's nationality so long as he does a good job of work for the firm. K.L.M. at present has some six American pilots, one or two Australians, Russians, Germans, Danish and Swedish on their staff. As these pilots have not been mobilised, their presence in the Dutch company is invaluable just at present.

The unrestful nature of the international situation is an unmitigated nuisance for commercial flying, not only because the skies everywhere are full of Air Force machines, but for a more important reason. I have it as the considered opinion of several leaders of civil aviation that, if the situation were peaceful, this summer would

COMMERCIAL AVIATION (CONTINUED)

have seen a boom in air transport so considerable that present air fleets would not have been able to cope with it.

Everybody knows that Sir Nevile Henderson arrived at Croydon from Berlin in a D.L.H. Ju.52 last Saturday, but it is little realised how much of the diplomatic activity of last week was, in effect, air activity. Everything which happens at a place like Croydon cannot, in these times, be reported in this column, but at least I am able to reveal, without infringing the Official Secrets Act, that an unusual traveller arrived one day last week at Croydon. This was a seven-months-old baby travelling unaccompanied in charge of the air hostess of a K.L.M. machine. It sucked its thumb in a secretive sort of way as it lay in its travelling basket in Customs and smiled cynically. Maybe it was the bearer of important despatches from somewhere or other.

That competitive spirit on the Empire routes between Imperials and K.L.M., of which M.P.s sometimes speak with concern, has broken out again. Some time ago Imperials produced a number of large red and black golfing umbrellas for the traffic staff to hold over lady passengers in wet weather. Not to be outdone, K.L.M. now has a number of blue and white umbrellas. A. VIATOR.

P.A.A. Make a Start

ON August 22 a Pan-American Airways' Boeing 314, *California Clipper*, left San Francisco on a survey flight to Auckland, New Zealand. Seven of the twenty-nine persons on board were merely passengers going to Honolulu, while the remainder consisted of a crew, numbering ten, and twelve representatives of the United States Government and P.A.A.

The Boeing will fly to Auckland via Canton Island and Noumea, in New Caledonia. The total distance is about 8,000 miles and the flight will occupy about a fortnight, several days being spent at each stopping point in order to study local conditions. P.A.A. have applied to the Civil Aeronautics Authority for permission to operate the service.

Atlantic Extension

AFTER the second of the two Imperial Airways' Atlantic boats, *Cabot*, had arrived at Montreal at 2.50 p.m. on Sunday, August 13, freight was transferred to a Trans-Canada Air Lines' Lockheed Fourteen and was delivered on the following day in Winnipeg at 4.50 a.m., in Calgary at 11 a.m., in Edmonton at 1 p.m., and Vancouver, on the Pacific coast, at 11.43 a.m. All these times, of course, are B.S.T. When *Cabot* returned across the Atlantic on August 17, twenty-two packages were sent over by Canadian National Express, who are responsible for handling the traffic in collaboration with T.C.A.L. and Imperials. Thus the Trans-Canadian air service fulfilled its primary purpose of completing the air link between this country and the Pacific coast.

Empire Mails by K.L.M.

FROM Australia comes the strong rumour that the British and Australian Governments will soon need to grant permission to the existing K.L.M. service between London and Sydney to carry the normal mail. Although it is a distinctly bad thing to subsidise foreign air lines to assist in the carriage of mails, Imperial Airways will certainly be in no position to carry the Christmas loads and, unless Royal Air Force help can be obtained, this may be the only way out of the difficulty. Since the Netherlands service has already carried surcharged mail between England and Singapore as well as mail to Australia from European centres, the granting of the necessary permission would not, in essence, create a new precedent. Meanwhile, it is also reported from Australia that the Tasman service plans have been indefinitely postponed owing to fleet shortage.

Expansion in the U.S.

THE American operating company, Airline Feeder System, has recently applied to the Civil Aeronautics Authority for permission to carry mail, passengers and freight on services serving the eastern, northern and southern states. If the permission is granted, Airline Feeder System will grow suddenly from the smallest airline operating company in the U.S. to the fifth largest in the country.

Previously A.F.S. have flown only one route, from New York to Sprinfield—a matter of 150 miles. But the new plans involve linking New York with points as distant as Atlanta, Jacksonville, Cincinnati and Pittsburgh.

The proposed system of routes is so laid out that it does not clash with any others, and the various services will be designed to act also as useful feeders to the existing main-line services. Survey flights are now being made with a Lockheed 10, and this type will probably be used for the runs. A minimum of one round trip a day is planned.

Salted Runways

A NEW use for the product of one of Canada's oldest industries, the mining of salt, has been found. Most of the airports used by Trans-Canada Air Lines have salted runways, these being a result of one of the most recent developments in soil stabilisation. Actually a mixture of salt and clay is used for the purpose, and this mixture was originally discovered to be useful as a surface veneer for gravel roads.

More Flamingos for Jersey

JERSEY AIRWAYS have now placed an order for three D.H. 95s or Flamingos. These will be laid out as eighteen-seaters for the comparatively short runs between Heston, Southampton, Jersey and Guernsey.

The first of the three will be delivered next month (September), and will replace the prototype which has been temporarily in use by Jersey and Guernsey Airways.

Singapore-Sydney Change?

FOLLOWING Mr. Fairbairn's visit to Portuguese Timor, it seems probable that the Empire boats operating between London and Sydney may shortly be making an extra call once a fortnight at this point, and possible that there will be additional services linking Timor with Australia. Mr. Fairbairn, who is the Australian Minister for Civil Aviation, has put this suggestion before his Government, and the present indications are that it will be accepted. Incidentally, there are valuable Australian oil concessions in Timor, near Dilli, though these have not been developed during the last twenty-five years because of transport difficulties.

Glasgow's Airport

THE scheme for a municipal airport in the Clyde area is being revived. The Air Ministry is under agreement with Renfrew Town Council to maintain Renfrew Airport until 1941, after which it is intended to layout a new aerodrome. A number of sites have been surveyed and definite proposals regarding them will be submitted to the authorities concerned as soon as circumstances permit.

Twelve years ago Glasgow Corporation decided to take over Abbotsinch as a municipal airport, but abandoned the project when the Air Ministry intervened and acquired part of the site for the R.A.F. One suggestion under consideration is that Abbotsinch should be extended and used both for civil and service work.

Something New

SINCE nobody had previously heard much (or anything) about the plans, it can be reasonably imagined that the new British Airways' service via Newcastle, Stavanger and Stockholm, to Finland is of recent political significance. Actually the service is an obvious development of the situation and will replace, in case of serious trouble, those previously flown to Stockholm and Warsaw via Hamburg and Berlin respectively.

The initial flight in connection with its operation was made last Monday, when a Lockheed Fourteen left Heston airport at 9.15 for Helsingfors. Because of thick fog on the east coast, the machine flew non-stop to Stavanger and to Stockholm and Helsinki. Among those travelling on the first flight were Mr. J. J. W. Herbertson of the British Air Ministry, and Mr. D. A. Adkins of British Airways. The machine was in charge of Cdr. D. S. King. The return flight was due to be made on Tuesday.

SERVICE AVIATION

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

FLEET FIGHTER : A study of the Blackburn Roc two-seater fleet fighter (Bristol Perseus) as now being delivered to the Fleet Air Arm. It has a multi-gun Boulton Paul turret.

Observer Corps : Ministry Takes Over

IT is announced that members of the Observer Corps, hitherto enrolled as special constables, will henceforth come under the administration of the Air Ministry. The Corps will continue to function as before and personnel will not be changed.

The Observer Corps comprises two classes. Class A includes Observers who undertake 48 hours duty each week for the duration of a war. These will be paid 1s. 3d. an hour with a maximum of £3 a week.

Class B includes Observers who undertake a maximum of 24 hours duty a week for three months. The pay will be the same as for Class A, except that no definite hours of duty or length of service after three months can be guaranteed.

Director General of Royal Air Force Medical Services

THE Air Ministry announces that the status of Director of Royal Air Force Medical Services has been advanced to that of Director-General with the rank of Air Marshal.

A.V-M. Sir A. V. J. Richardson, K.B.E., C.B., M.B., B.Ch., D.P.H., K.H.S., Director of Royal Air Force Medical Services, has become Director-General and has been promoted to the rank of Air Marshal, with effect from August 1.

Air Marshal Richardson was granted a permanent commission as Wing Commander in the Medical Branch of the Royal Air Force on August 1, 1919. He was at that time Principal Medical Officer at Headquarters, Middle East Command. He has since served as Principal Medical Officer at the Royal Air Force Headquarters in India and Iraq and at Coastal and Bomber Commands at home. Air Marshal Richardson holds the D.P.H. with honours from Trinity College, Dublin. He is a Hudson Silver Medallist, a Prizeman of Adelaide Hospital, Dublin, and an Honorary Surgeon to H.M. the King.

R.A.F.V.R.: Accountant Branch

A NEW branch of the Royal Air Force Volunteer Reserve is to be established to provide a reserve of accountant officers for the Accountant Branch of the Royal Air Force. Requirements are limited to 85 officers, and, for the present, recruitment will be restricted to candidates resident in the London area who are able to attend for evening instruction in the Central London district. Candidates must be between their 32nd and 40th birthdays. They must be physically fit and must be able to show that in addition to theoretical qualifications, they have had, whether as articled pupils or otherwise, a wide practical experience of accountancy.

Applications for appointment should be addressed to the Under Secretary of State (S.11 (e)), Air Ministry, Kingsway, London, W.C.2, where full particulars can be obtained.

Vacancies for Apprentice Clerks

A SUBSTANTIAL number of boys of school certificate (or approximately equivalent) educational standard will be required in October to fill vacancies for apprentice clerks under the new recruiting programme. Candidates must be not less than 15½ years of age and not more than 17½ years of age on October 1 this year.

Finnish Officer Attached

CAPT. T. APPELROTH, of the Finnish Air Force, has been attached to an Air Armament School for one week with effect from August 21.

Recruiting Returns

DURING the week ending August 19, 608 recruits joined the R.A.F., compared with 671 in the corresponding period last year. This brings the total entry of pilots, observers, airmen and boys since April 1 to 16,552. Last year the corresponding figure was 8,754.

A Ceylonese Effort

SQN. Ldr. C. W. Ling and Mr. W. E. Taylor, of the Air Ministry, having completed investigations in Colombo, have recommended the formation of an R.A.F. Reserve in Ceylon. They have stated that if the Ceylon State Council will vote the necessary money, Britain will send six training machines to Ceylon and will supply Service types when necessary. It is also recommended that the Ceylon Aero Club be asked to train pilots.

Flying Accidents

THE Air Ministry regrets to announce the following flying accidents:—

F/O. York Plant Wilson, P/O. Ivor Russell Barton and A/C.1 James Alexander Lowery lost their lives in an accident which occurred near Yeovil on July 21 to an aircraft of No. 148 Squadron.

Sgt. Donald Victor Peacock (flying solo) lost his life in an accident which occurred at Hooton Roberts, Yorkshire, on August 21, to an aircraft of No. 72 Squadron.

With reference to the disappearance on August 19 of an aircraft of No. 209 Squadron, the Air Ministry announces with regret that, as extensive searches have failed to find the aircraft and its occupants, it must now be accepted that the following personnel lost their lives on that date:—F/O. (Acting Flt. Lt.) Frederick Ernest Royston King; F/O. Arthur Frederick Barber; L.A/C. Donald Fulcher; A/C.1 David George Poeten Ash; A/C.1 Walter Joseph Jeckells; A/C.2 Leslie Samuel Freshwater.

F/O. (Acting Flt. Lt.) King and F/O. Barber were the first and second pilots of the aircraft and L.A/C. Fulcher, A/C.1 Ash, A/C.1 Jeckells and A/C.2 Freshwater were the other members of the crew.

Flt. Sgt. Cecil Eneder Higgins, L.A/C. Reginald John Machin and A/C.1 Douglas Treadwell lost their lives in an accident which occurred at Martlesham Heath, Suffolk, on August 23, to an aircraft of the Aeroplane and Armament Experimental Establishment. Flt. Sgt. Higgins was the pilot and L.A/C. Machin and A/C.1 Treadwell were the other members of the crew.

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Royal Air Force

General Duties Branch

J. Fleming is granted a permanent commission as Pilot Officer with effect from August 5 and with seniority of November 5, 1937.

The following are granted short-service commissions as Acting Pilot Officers on probation for six years on the active list on the dates stated:—F. J. Aldridge, A. D. Alexander, H. C. S. Armstrong, J. Atkinson, R. H. Barber, G. C. R. Barker, G. R. Bennette, N. E. Berrington-Pickett, N. H. Bigsby, M. R. Braun, A. J. S. Buller, G. Bunce, A. R. McL. Campbell, P. A. Clough, W. J. O. Coleman, J. Curchin, K. C. D. Dart, G. J. Drake, N. G. Drever, J. V. Eason, P. C. Elliott, J. C. Fleming, E. T. Francis, J. H. H. Gladdis, P. J. Gordon-Hall, D. Hastings, P. E. Henn, K. J. Hide, R. G. Kennedy, G. O. R. Kilner, O. E. Lamb, A. W. McCandlish, G. J. McFarland, C. A. McGaw, W. D. Mackley, G. de V. Maritz, M. A. G. Mason, A. G. Maycock, R. F. G. Miller, K. M. Millist, C. R. Montgomery, R. H. Morton, A. J. Mullock, G. K. Noble, H. W. Noble, T. F. O'Byrne, A. J. Ogilvie, D. C. Pascall, S. E. Pattinson, D. W. Peck, N. R. Peel, L. L. Pennington, R. F. Philo, R. A. Plumb, J. R. E. Procter, J. R. Rainford, S. J. Rawlins, B. D. G. H. Reid, C. R. S. Rich, F. T. Roberts, F. A. Robshaw, A. C. Rowe, E. A. E. Sedgley, B. Simpson, D. J. Spence, L. A. Stamer, W. B. H. Statham, A. F. Stidston, R. T. Stubbs, E. A. Tingey, P. C. Traill-Smith, D. P. Tuppen, W. L. Vickerstaff, H. J. E. Walsh, L. S. B. Worrall, D. A. Young (August 5); P. J. S. Boggis, H. W. A. Britton (August 8).

The following are granted short-service commissions as Acting Pilot Officers on probation for four years on the active list. (August 5):—A. R. Blackett, G. V. Donald, I. Dromgoole, J. K. Flynn, W. D. Heaphy, H. G. Holmes, W. M. Lewis, A. S. Malcolm, W. McC. Osborne, A. J. Pinhorn, A. H. Sanders, N. H. H. Smith, R. Ward, D. Welply.

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation (July 25):—D. M. B. Druce, J. D. Young.

F/O. (Acting Flt. Lt.) F. F. Rainsford is promoted to the rank of Flight Lieutenant (July 20).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—R. C. Simmons (July 12); W. P. Green, H. M. Robertson, F. G. Dutton, H. G. Muller, P. J. R. Kitchin, R. Sawrey-Cookson, D. W. Reacher (July 21); L. J. Fry (August 8); D. J. Devitt (August 16).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—J. B. Burnett (May 1); L. C. Withall (May 31); C. L. Gilbert (July 7); E. J. Brooks (July 15); P. M. Astley (July 22); A. F. McGhie, D. B. Hobson (July 24); H. E. Bufton (August 7).

The following Pilot Officers are granted the acting rank of Flight Lieutenant on the dates stated:—J. D. V. Porter (March 2); T. M. W. Smith, W. V. Gordon, D. C. McKinley (May 1); J. A. Leathart (July 24); J. E. Boulton (July 31).

The following Flying Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—M. M. J. Stevens (July 22); G. T. B. Clayton (August 2); C. L. Gilbert (August 7).

The following Pilot Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—D. C. McKinley (May 8); R. E. Craven (May 9); D. L. Wolfe (July 25); J. Stewart (August 8).

P/O. C. P. N. Brett takes rank and precedence as if his appointment as Pilot Officer bore date May 31, 1938, immediately following P/O. C. F. Kirkwood-Hackett in the Gradation List, reduction to take effect from July 20; Group Capt. the Hon. L. J. E. Twisleton-Wykeham-Fiennes is placed on the retired list (August 18); Sqn. Ldr. A. T. K. Shipwright, D.F.C., is placed on the retired list on account of ill-health (August 12); P/O. N. Williams relinquishes his short-service commission on transfer to the Royal New Zealand Air Force (July 24); the short-service commission of Acting Pilot Officer on probation S. P. Slattery is terminated on cessation of duty (August 16).

Equipment Branch

The following Acting Pilot Officers on probation are graded as Pilot Officers on probation on the dates stated:—W. G. Sansom (March 27); H. J. Brass (June 27).

The following Flying Officers are granted the acting rank of Flight Lieutenant (April 14):—W. J. Stutchbury, C. T. Wardman.

Accountant Branch

The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer (June 10):—G. G. Robinson, H. C. Staines.

Medical Branch

The commission of F/O. I. H. Barclay, M.B., B.S., is antedated to August 1, 1938, and he ceases to be seconded to the Royal Victoria Infirmary, Newcastle-on-Tyne (August 1).

Chaplains Branch

The Rev. J. M. Wright, B.A., is granted a short-service commission with the relative rank of Squadron Leader (August 4).

Commissioned Engineer Officer

W/O. E. S. Leary is granted a commission as Flying Officer on probation with effect from July 27 and with seniority of June 12.

Commissioned Physical Training Officers

The following Warrant Officers are granted commissions as Flying Officers on probation (August 10):—J. Digby, J. S. Lancaster, F. A. Warner, P. F. Picton.

Memorandum

The permission granted to the following officers to retain their rank is withdrawn with effect from the dates stated on their enlistment into the Auxiliary Air Force:—Lt. H. M. Whitehead (June 13, 1938); Sec. Lt. C. Norton (October 1, 1938); Lt. A. M. Chalmers (October 9, 1938); Sec. Lt. S. V. Pearce (October 17, 1938); Sec. Lt. L. Arnold (October 20, 1938); Sec. Lt. W. F. A. Snell (February 3); Lt. S. F. R. Hulbert (February 27); Sec. Lt. W. E. Harper (March 20).

Erratum

In the *Gazette* of August 8, for Maurice Cray Kinder read Maurice Craig Kinder.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Major J. B. Vernon is granted a commission in Class CC as Squadron Leader (June 5); Sqn. Ldr. E. P. Hardman, D.F.C. (R.A.F.O.), is appointed to a commission in Class CC as Flight Lieutenant (Honorary Squadron Leader) with effect from March 21, and is granted the rank of Squadron Leader with effect from April 28.

The following are granted commissions in Class CC as Flight Lieutenants (Honorary Squadron Leaders) on the dates stated:—Lt.-Col. St. J. A. Browne (I.A., Ret.) (April 1); Capt. W. E. Bredin (R.A.R.O.) (July 3).

The following are granted commissions in Class CC as Flight Lieutenants on the dates stated:—Capt. J. A. Willoughby (January 30); Lt. C. V. Kelway (May 30); Capt. J. C. Perkins (June 15); Maj. M. C. Brotherton (June 16); R. F. A. W. Williams (June 19); Lt. D. S. F. E. Maule-Cole (June 26); Capt. E. G. Holden (R.A.R.O.) (July 4).

The following are granted commissions in Class CC as Flying Officers on the dates stated:—Lt. F. V. Sheard (June 12); Capt. L. S. Lloyd (June 24); N. W. Jones (June 27).

The following Flight Lieutenants are granted the rank of Squadron Leader on the dates stated:—J. R. Gifford, M.B.E., M.C. (May 8); L. S. Weedon (June 7); T. J. Southern (June 9); J. C. Mitchell (June 24); J. H. Page (June 27); B. B. Dowling (July 1).

The following Flying Officers are transferred from Class A to Class C on the dates stated:—J. Boston (January 2); H. A. Yeo (April 11).

F/O. A. W. Crees relinquishes his commission on completion of service and is permitted to retain his rank (May 25).

The following Flying Officers relinquish their commissions on completion of service on the dates stated:—H. W. R. Banting (June 22); R. B. Whittingham (August 6).

Miscellaneous

Capt. J. H. Gurney is appointed Assistant Provost Marshal, and is granted a commission in Class CC in the rank of Flight Lieutenant (April 23).

Erratum

In the *Gazette* of August 8, for Capt. E. K. Cormudy (R.A.R.O.) read Capt. E. K. Cormody (R.A.R.O.).

Royal Air Force Volunteer Reserve

General Duties Branch

The following are appointed Honorary Flight Lieutenants on the dates stated:—Maj. J. E. de Kantzow (June 26); Lt.-Col. J. R. Robertson, D.S.O. (June 28).

The Rev. W. E. Wroughton is granted a commission as Acting Pilot Officer on probation (August 14).

Administrative and Special Duties Branch

R. A. Smith is granted a commission as Pilot Officer on probation with the honorary rank of Squadron Leader (May 11). (Substituted for notification in *Gazette* of July 18.)

The following are granted commissions as Pilot Officers on probation (August 15):—R. A. Nunn, J. F. A. Segner.

R. D. Barlas is granted a commission as Acting Pilot Officer on probation (July 18).

Equipment Branch

The following Acting Pilot Officers are graded as Pilot Officers on the dates stated:—A. R. Grutchfield, L. W. Stotter (May 17); M. D. Crichton, A. J. Sanford, H. C. Windsor (May 24); R. T. Cackett, G. J. Bulman, J. P. Bennett, L. N. Bennett, R. H. Berry, W. E. Gower, M. K. Tapp (May 31); E. R. J. Smith, C. D. Biggs, G. E. Runeckes, L. M. Kitching, T. G. P. Hidson, R. A. J. Horne, R. S. W. Macfarlan, L. D. Neeves, H. B. Whissell, S. W. Yardley (June 7); D. W. Chapman, D. A. Doughty, E. A. Jackson, T. G. Ratcliff, A. L. Smith, G. P. Stevens (June 14); G. M. Elloart, D.F.C., G. N. Ricks, W. E. G. Vaughan, A. L. Allen, M. Bowles, P. F. Humphreys, C. D. King, J. Moorhouse, F. A. H. Small, H. S. Wolff (June 21); M. V. J. de Faque de Jonquierès, J. S. Thomas, P. H. Riggs, K. V. McKenzie, W. F. Blackman, A. D. Hadler, H. G. Hanks, H. W. Heycock, E. D. B. Payne, W. Royle, T. H. Snelling (June 28); O. M. Berkeley, J. G. Davis, R. E. W. Little, C. Cooke, R. G. Kingston, E. D. W. Mercer, F. L. Mills, A. E. B. Rich, E. A. Sadler, A. H. K. Stevens (July 5); J. D. Neil, C. R. C. Marlow, P. H. Youngman, C. W. Harman, R. H. Gollan, H. A. Jordan, B. A. Taylor (July 12); A. Beare, D. R. S. P. Quin, A. C.

Ridge, E. B. Wilson, D. F. Hackett, F. C. Emerson, F. H. Farthing, A. L. Godden, A. Jones, J. C. Jordan, H. D. Paterson (July 19); J. F. H. Adams, J. W. J. Bates, M. J. P. F. H. D'A. De Froberville, C. E. Polack, W. B. Paton, J. Smith, R. E. N. Tasker, E Taylor, E. J. Vince, F. D. Wheeler (July 26)'; A. R. Brodie, C. E. Ball, W. P. Beddow, E. F. Clear, F. D. Deeley, I. R. Mascall, J. C. Rose, J. R. Slater (August 2); J. L. King, C. H. Keeble, E. W. Neech, A. E. Antill, G. J. Gilbody, E. G. J. Neaves, H. S. Paine, W. A. Steward, J. B. Stewart, N. M. Walker (August 9); C. W. S. Collins, H. C. Kendall, H. L. Ruse, D. F. Tubbs, R. B. Pavey (August 16).

The following Pilot Officers are employed with the Royal Air Force with effect from the dates stated':—O. M. Berkeley (June 28); C. A. Smith (June 29).

P/O. A. E. B. Rich ceases to be employed with the Royal Air Force (July 31).

Medical Branch

F/O. A. F. W. Anglin, M.D., L.M.S., relinquishes his commission on account of ill-health (August 9).

Meteorological Branch

Erratum

The list of officers commencing with P. D. Bailey and ending with E. J. Wenham, notified in the *Gazette* of August 8, and the list commencing with A. F. E. Cotton and ending with L. R. Morey, in the *Gazette* of August 15, should be commissioned in the rank of Acting Pilot Officer on probation and not Pilot Officer on probation as stated.

Auxiliary Air Force

General Duties Branch

No. 500 (COUNTY OF KENT) SQUADRON.—J. G. Lane is granted a commission as Acting Pilot Officer (July 29). No. 501 (COUNTY OF GLOUCESTER) SQUADRON.—K. R. Aldridge is granted a commission as Acting Pilot Officer (July 15). No. 600 (CITY OF LONDON) SQUADRON.—The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—A. G. Miller (May 4); R. Hiscox (May 7). No. 614 (COUNTY OF GLAMORGAN) SQUADRON.—The following Flying Officers are granted acting rank of Flight Lieutenant (unpaid) (July 1):—M. L. Edwards, N. S. Merrett. No. 615 (COUNTY OF SURREY) SQUADRON.—A. J. J. Truran is granted a commission as Acting Pilot Officer (July 22). No. 901 (COUNTY OF LONDON) SQUADRON.—H. E. C. Rubie is granted a commission as Flying Officer (August 4). No. 902 (COUNTY OF LONDON) SQUADRON.—Acting P/O. G. Carleton is promoted to the rank of Flying Officer (July 14). No. 903 (COUNTY OF LONDON) SQUADRON.—Acting P/O. A. G. Birch is promoted to the rank of Flying Officer (July 28). No. 905 (COUNTY OF SURREY) SQUADRON.—T. G. M. Weldon is granted a commission as Pilot Officer (August 4). No. 906 (COUNTY OF MIDDLESEX) SQUADRON.—Col. H. L. Nathan, D.L., M.P., is appointed Honorary Air Commodore (August 22). No. 908 (COUNTY OF ESSEX) SQUADRON.—F/O. J. S. Saxby is promoted to the rank of Flight Lieutenant (May 25). No. 909 (COUNTY OF ESSEX) SQUADRON.—F/O. T. A. Huson is promoted to the rank of Flight Lieutenant (July 17). No. 910 (COUNTY OF ESSEX) SQUADRON.—Capt. C. A. Francis is granted a commission as Flying Officer (July 10). No. 913 (COUNTY OF WARWICK) SQUADRON.—The following are granted commissions in the ranks and on the dates stated:—P/O. H. E. Grove (July 26); Acting P/O. C. W. S. Crabbe (August 4). No. 914 (COUNTY OF WARWICK) SQUADRON.—Acting P/O. G. A. Newenham is promoted to the rank of Flight Lieutenant (June 6). No. 915 (COUNTY OF WARWICK) SQUADRON.—Acting P/O. R. S. Pearce is promoted to the rank of Flight Lieutenant (June 7). No. 918 (COUNTY OF DERBY) SQUADRON.—A. P. Cotterell is granted a commission as Acting Pilot Officer (July 11). No. 919 (WEST LANCASHIRE) SQUADRON.—E. Springman is granted a commission as Acting Pilot Officer (July 11); P/O. G. E. Rolleston is transferred to No. 920 (West Lancashire) Squadron (May 17). No. 920 (WEST LANCASHIRE) SQUADRON.—P/O. G. E. Rolleston is promoted to the rank of Flight Lieutenant (May 17). No. 921 (WEST LANCASHIRE) SQUADRON.—Capt. J. R. Milne, D.F.C., is granted a commission as Flight Lieutenant (May 16). (Substituted for notification in the *Gazette* of August 1 concerning this officer.) No. 926 (EAST LANCASHIRE) SQUADRON.—F. O'Brien is granted a commission as Acting Pilot Officer (July 14). No. 927 (COUNTY OF GLOUCESTER) SQUADRON.—J. R. Bagnall-Oakeley is granted a commission as Acting Pilot Officer (August 4). No. 928 (COUNTY OF GLOUCESTER) SQUADRON.—C. D. Newman is granted a commission as Acting Pilot Officer (August 4). No. 930 (HAMPSHIRE) SQUADRON.—H. G. Bird is granted a commission as Acting Pilot Officer (August 4). No. 932 (HAMPSHIRE) SQUADRON.—The following are granted commissions as Acting Pilot Officers on the dates stated:—A. R. Avens (July 14); A. R. Bewes (July 15). Acting P/O. R. V. N. Shutte is promoted to the rank of Flying Officer (July 29). No. 933 (HAMPSHIRE) SQUADRON.—The following are granted commissions as Acting Pilot Officers:—C. H. F. Palser, A. W. Dent (August 4). Acting P/O. E. W. Ward is promoted to the rank of Flying Officer (July 29). No. 934 (COUNTY OF DEVON) SQUADRON.—Sqn. Ldr. C. L. Pendlebury, M.C., T.D., is promoted to the rank of Wing Commander and appointed to the command of No. 13 Balloon Centre (July 13). The following Acting Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—W. E. Blakeney (July 21); J. B. Burnard (July 22); R. J. Baker-Wilbraham (July 23); P. D. Tuckett (July 24). No. 939 (WEST RIDING) SQUADRON.—F. S. Buchanan is granted a commission as Pilot Officer (August 4). No. 941 (WEST RIDING) SQUADRON.—The following are granted commissions as Pilot Officers on the dates stated:—A. C. Gardner, W. J. S. Mills (August 4); A. J. Jack (August 9). No. 946 (CITY OF GLASGOW) SQUADRON.—J. Robertson is granted a commission as Pilot Officer (July 16). No. 947 (CITY OF GLASGOW) SQUADRON.—G. S. Pollock is granted a commission as Pilot Officer (August 4).

Equipment Branch

The following Flight Lieutenants relinquish their commissions on the dates stated on cessation of duty:—W. B. Frederick (May 4); A. H. Graham (May 8).

No. 909 (COUNTY OF ESSEX) SQUADRON.—A. C. McCarthy is granted a commission as Pilot Officer (August 10).

Accountant Branch

No. 608 (NORTH RIDING) SQUADRON.—W. U. Hodson, M.C., is granted a commission as Flying Officer (May 20). No. 907 (COUNTY OF MIDDLESEX) SQUADRON.—R. H. Burdon-Cooper is granted a commission as Pilot Officer (August 9).

Medical Branch

No. 936 (COUNTY OF NORTHUMBERLAND) SQUADRON.—K. A. W. Law, M.B., B.S., is granted a commission as Flying Officer (August 9). No. 939 (WEST RIDING) SQUADRON.—E. C. I. Foot, M.R.C.S., L.R.C.P., is granted a commission as Flying Officer (August 11). No. 943 (EAST RIDING) SQUADRON.—J. Glover, M.B., Ch.B., is granted a commission as Flying Officer (August 9).

Errata

In the *Gazette* of July 28, for Major T. A. Carlisle read Major T. A. Carlile; in the *Gazette* of August 1, for W. G. Remond read W. G. Redmond.

Auxiliary Air Force Reserve of Officers

Accountant Branch

F/O. W. U. Hodson, M.C., relinquishes his commission (May 20).

A German Machine Gun

SOME unique features characterise a new German gas-operated light machine gun known as the Knott-Bremse (K.B.). The weapon is of 7.9 mm. calibre and has a special muzzle attachment which makes use of the gas only after the bullet has left the barrel. As a result the muzzle velocity is not affected. Normally, of course, gas-operated guns tap the gas from a point near the end of the barrel. Specially bladed channels conduct the gas to the piston which operates the breach and which constitutes the only moving element, the air-cooled barrel being stationary. A change of barrel is recommended after 200-250 rounds, depending on the rate of fire. The muzzle attachment is shaped to act as a recoil brake and it is claimed that the gun is very steady in operation. The weight is just under 20 lb., the rate of fire up to 1,000 rounds a minute and the muzzle velocity 2,460ft./sec.

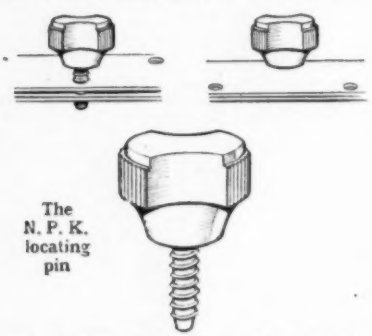
FRANCE'S FIRST DOUGLAS BOMBER: The first Douglas DB-7 bomber for *l'Armée de l'Air*. It does over 300 m.p.h. with two Twin Wasp SC3-G engines giving 900 h.p. each at 2,550 r.p.m. at 12,000 ft. It is among the first twin-engined military machines to have a tricycle undercarriage.

THE INDUSTRY

Rivet Location Simplified

IN the manufacture of modern aircraft the location of material for purposes of riveting plays a considerable part in the speed and accuracy of the work. Because the materials to be riveted are apt to be subjected to vibration and are also liable to creep, the problem of locating the work with pins is not as simple as it would at first seem. However, Guest, Keen and Nettlefolds, Ltd., of Heath Street, Birmingham, 18, have introduced a locating screw with a moulded head for which certain outstanding advantages are claimed.

This screw—it is known as the N.P.K. locating screw—has a metal-threaded body, the thread being formed firmly to clamp the parts through which it passes. It also has a moulded head, milled and provided with a shoulder on the screw side. It cannot score the sheets, because the moulded shoulder serves as a protective buffer. Should the operator attempt to overtighten the screw by using a pair of pliers the moulded head will break and expose a normally slotted screw head so that



The N. P. K. locating pin

an ordinary screw driver can be used to take out the body of the screw. The screw itself is hardened so that, but for this provision, its withdrawal might be difficult.

Tests with the N.P.K. locating screw with the pop or Chobert riveting processes, where the rivet must fit very closely into the sheet, have shown that there is no tendency to over-enlarge the hole. Consequently there is no risk of a slack rivet.

The N.P.K. locating screw is made with the moulded head in three different colours according to the sizes, which are $\frac{3}{32}$in., $\frac{1}{8}$in and $\frac{5}{32}$in.

Arc-Lamp Operation

THERE will be many drawing-office executives who will be interested in a little booklet that has just been published. It deals with the points to be observed in order to ensure efficient operation of arc lamps used in making blue prints, plans and photostat copies.

This booklet, which is issued by Charles H. Champion and Co., Ltd., National House, Wardour Street, London, W.1, is divided into two sections, the first of which deals with principles and operation, and the second with troubles and remedies. The text in each case is fully supported by illustrations, diagrams and tabular matter. The large number of practical hints given should prove most useful.

Herculean Output

ONE of the new Bristol Hercules, 1,375 b.h.p. sleeve-valve engines recently completed a strenuous series of flight trials, lasting for over 170 hours—the equivalent of some 38,000 miles' flight. Nearly half of this, it is stated, was carried out at a maximum rated cruising speed and throttle position, while over 60 hours were under severe economical cruising conditions, with weak fuel mixtures and correspondingly high flame temperatures in the cylinders. In addition 14 full-throttle climbs were made to 16,000 feet.

A significant fact emerged as a result of the trials. The engine was check-tested on the dynomometer before and after the trials and, it is claimed, showed an appreciable general increase of power output at the conclusion of the tests.

On stripping for the detailed examination of the components, add the makers, the sleeves and cylinders were found to be in faultless condition. Other important parts such as the pistons and big end bearings gave additional evidence of the thoroughly sound design and construction of the Hercules.

Progress

AT the recent annual general meeting of Cornercroft, Ltd., the well-known aeronautical and general engineers, the chairman, Capt. W. F. Strickland, M.P., said that the company had made great progress since its formation as a public company three years ago. The past year could be described as a period of consolidation and preparation for a further advance. Both the company and its subsidiary continued to receive a reasonable share of orders for work of national importance, but a considerable proportion of their turnover was in no way connected with re-armament.

The net profit for the year amounted to £34,192, compared with £30,022 for 1933-1938—an increase of 14 per cent. It was expected that substantial benefits would be derived from the subsidiary company during the coming year. The company had been able to maintain a dividend of 15 per cent. for the year on the increased capital and to allocate £5,000 to general reserve.

An Important Development

A NOTEWORTHY event in the plastics industry is the announcement that the Distillers Co., Ltd., has concluded an arrangement with the British Xylonite Co., Ltd., to take a half interest in the latter company's subsidiary, B.X. Plastics, Ltd.

B.X. Plastics, Ltd., are the manufacturers of Xylonite, Bexoid (cellulose acetate), Lactoid (casein), moulding powders and film. On the other hand, the Distillers Co., in addition to its better-known activities, produces a number of raw materials used in the manufacture of plastics, in which field it has undertaken considerable research work. One of the results of this work has been the development of the synthetic resin, Distrene.

The combination of the large financial resources, chemical manufacturing experience and research facilities of the Distillers Co. with the long experience of the British Xylonite Co. in the production and sale of plastics should ensure successful results.

A PLASTIC EXTENSION: Mr. S. Mills, of Ellison Insulations Ltd., has been appointed manager of this company's new branch at Kent House, 21, Spring Gardens, Manchester, 2 (Deansgate 5105). This office will control all the selling arrangements for Tufnol in the North of England. Mr. Mills will be assisted by Messrs. J. Burns and A. W. Manning.

A Rollason Surprise

EARLY this week Capt. W. A. Rollason announced that he was no longer actively associated with Rollason Aircraft Services, Ltd., of Croydon and Hanworth Airports. Capt. Rollason, who was the founder and a director of this company, asks that all private communications should be addressed to him at Buckingham Way, Wallington, Surrey.

In Brief

THE metallurgical applications of aluminium and its alloys are described in a comprehensive but not too involved survey published by the Aluminium Information Bureau, Bush House, London W.C.2. The survey deals in a simple manner with the properties of aluminium and aluminium alloys. Data, chemical and mechanical, is given in abbreviated form.

* * *

Two leaflets, one dealing with duct and immersion thermostats and the other with a new chart showing the relation between dry-bulb temperature, relative humidity and dew point have been recently issued by The British Thermostat Co., Ltd., of Windmill Road, Sunbury-on-Thames, Middlesex.

* * *

When Sir Malcolm Campbell recently created the new World's record of 141.74 m.p.h. on Coniston Water he was wearing a pair of Luxor No. 12 goggles fitted with prescription lenses. Luxor goggles are made by E. B. Meyrowitz, of 1a, Old Bond Street, London, W.1.

* * *

Nearly all ground engineers will find the catalogue dealing with the application and installation of the Graviner fire-fighting equipment useful to have by them, particularly in view of the new Air Ministry regulations dealing with fire extinguishing equipment on aircraft. Copies of this catalogue are obtainable on application to the Graviner Manufacturing Co., Ltd., First Avenue House, High Holborn, London, W.C.1.

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THE AIRCRAFT ENGINEER

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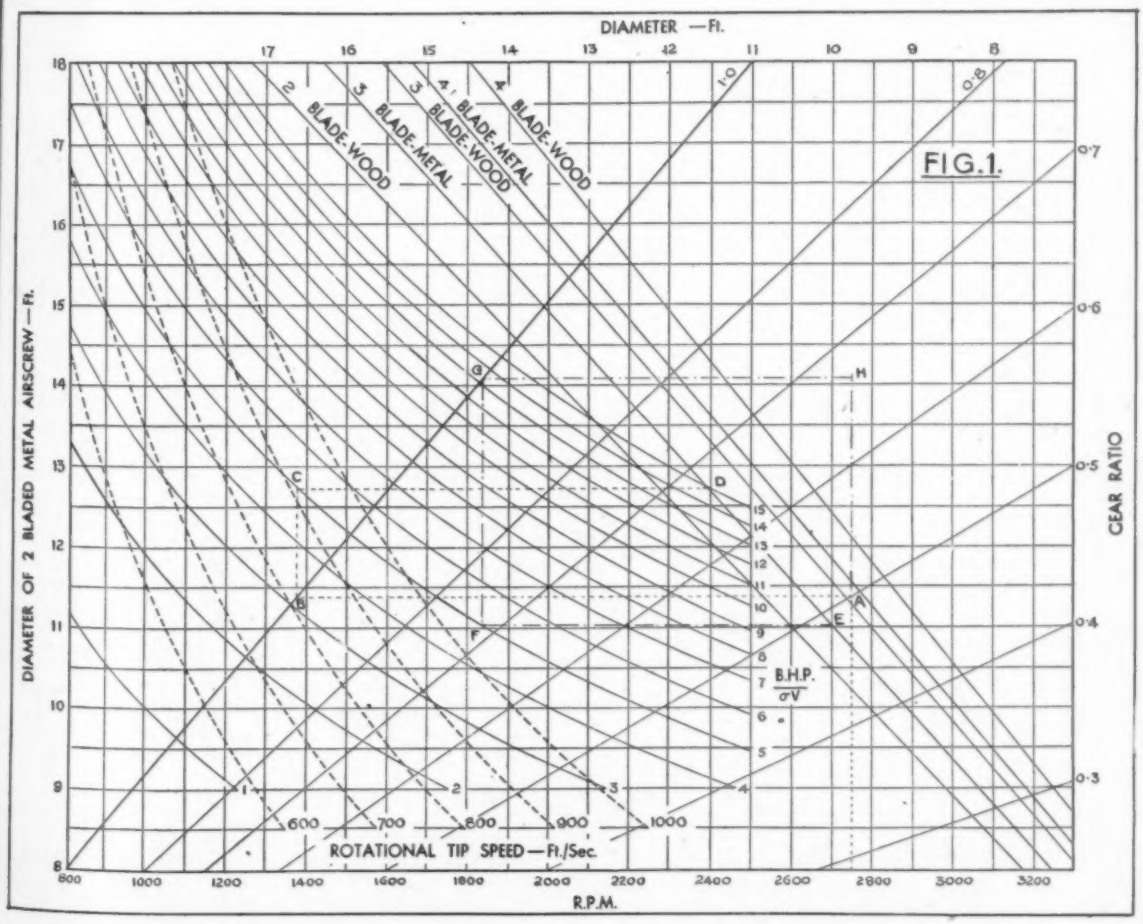
AIRSCREW DIAMETERS and GEAR RATIOS

A Rapid Means of Estimation

By Lt. Col. J. D. BLYTH, O.B.E., F.R.Ae.S., F.R.S.A., M.I.Ae.E.

THE accompanying diagrams have been prepared to afford a rapid means of estimating the diameter of an airscrew when the design conditions of speed, height, engine power and r.p.m., and gear ratio are known, or alternatively of determining the most suitable gear ratio when the diameter is limited by considerations of tip speed or clearance.

There are a number of formulæ which may be used in making a first estimate of the diameter of an airscrew, and although the results obtained from them are not identical the differences are not of sufficient magnitude to matter in a preliminary investigation. The particular formula adopted for the preparation of the curves in Fig. 1 is that given by Captain Liptrot in the *Handbook of Aeronautics*



(Pitman), namely

$$D^4 = K \cdot \frac{10^{10}\ BHP}{\sigma N^2 V}$$

where D is the airscrew diameter in feet, BHP the brake horse-power of the engine, N the airscrew r.p.m., V the design speed in m.p.h., $\sigma = \rho/\rho_0$ for the design height, and K is a coefficient depending upon the number and material of the blades.

Fig. 1 is a diagram for the determination of the diameter or the gear ratio and also the rotational tip speed. Before it can be used, however, the value of $\frac{BHP}{\sigma V}$ must be known, and Fig. 2 has been prepared to facilitate its evaluation without reference to a table of atmospheric constants. Fig. 3 obviates the necessity for arithmetical calculations in determining the true or helical tip speed from the combination of rotational tip speed and forward speed of the aircraft. The method of using the diagrams will be made clear by the solution of a few examples.

Helical Tip Speed

Example 1. If the rotational tip speed is 700 ft./sec. and the forward speed is 400 m.p.h., find the helical tip speed.

Using Fig. 3, a line is drawn from the point 700 on the tip speed scale to the point 400 on the V m.p.h. scale.

FIG. 2.

This line intersects the conversion line AA at the value 4.1 on the rotational scale. The line joining the point 400 on the V scale to the value 4.1 on the helical scale on AA is produced to meet the tip speed scale, and its point of intersection with the tip speed scale gives the helical tip speed, in this case 908 ft./sec.

Example 2. The forward speed is 350 m.p.h. What is the maximum permissible rotational tip speed if the helical tip speed is not to exceed 1,000 ft./sec. ?

The point 1,000 on the tip speed scale is joined to the point 350 on the V scale. The line joining these points intersects the helical scale on AA at the value 3.12. The line drawn through the point 350 on the V scale and the value 3.12 on the rotational scale on AA intersects the tip speed scale at the value 855 ft./sec., which is the rotational speed required.

To avoid possible confusion it should be noted that the transverse line through the point representing the rotational tip speed on the tip speed scale is always referred to the rotational scale on AA, and that a similar rule applies to helical tip speeds. It is obvious, of course, that the helical tip speed must be greater than the rotational tip speed.

Evaluation of $\frac{BHP}{\sigma V}$

Example. The design height and speed are 15,000ft. and 315 m.p.h. respectively, and the airscrew is to be designed to absorb 1,000 bhp. Find the value of $\frac{BHP}{\sigma V}$.

Using Fig. 2, draw a line through the values 315 on the V scale and 15,000 on the height scale, and through the point of intersection of this line and the reference line AA draw another line passing through the value 1,000 on the BHP scale. This line cuts the $\frac{BHP}{\sigma V}$ scale at the value 5, which is the required solution.

Airscrew Diameter

Example. Find the number of blades and approximate diameter of a metal airscrew to suit the following design conditions :

Speed : 315 m.p.h. at 15,000 feet.
Power : 1,000 bhp.
Engine r.p.m. : 2,750.
Gear Ratio : 0.5.
Helical tip speed to be not more than 1,000 ft./sec.

From Fig. 3 the maximum rotational tip speed is found to be 885 ft./sec., and from Fig. 2 the value of $\frac{BHP}{\sigma V}$ is 5.

In Fig. 1 draw the ordinate at 2,750 r.p.m. to cut the line representing 0.5 gear ratio at the point A. Through

FIG. 3.

A draw the abscissa AB cutting the 1.0 gear ratio line at B. Through B draw the ordinate BC cutting the curve $\frac{BHP}{\sigma V} = 5$ at C. From the scale at the left of the diagram the diameter of a 2-blade metal airscrew is seen to be 12′ 9″, and by interpolating between the curves shown in dotted lines the rotational tip speed is about 910 ft./sec. This value exceeds the maximum permissible and indicates that the diameter is too great. Through C draw the abscissa CD to cut the " 3 Blade-Metal " line at D Then from the scale at the top of the diagram (which refers to all airscrews other than 2-bladed metal) the diameter is seen to be 11′ 6″. Returning to the ordinate BC, the rotational tip speed of an airscrew of 11′ 6″ diameter is seen by interpolation to be about 820 ft./sec., which is within the specified limit. A 3-bladed metal airscrew of 11′ 6″ diameter, therefore, will suit the design conditions.

Gear Ratio

Example. The design conditions of speed, height, power, and engine r.p.m. are the same as in the previous example, but considerations of clearance limit the diameter of the airscrew to 10′ 0″.

(*a*) Determine the gear ratio if a three-bladed metal airscrew is specified and tip speed may be disregarded.

(*b*) Determine the most suitable gear ratio, diameter, and type of airscrew if the helical tip speed is limited to 1,000 ft./sec.

(*a*) The value of $\frac{BHP}{\sigma V}$ is 5, as before. The ordinate at 10′ 0″ on the top scale cuts the " 3 Blade-Metal " line at the point E. Through E draw the abscissa EF cutting the curve $\frac{BHP}{\sigma V} = 5$ at F. Through F draw the ordinate FG cutting the 1.0 gear ratio line at G. Through G draw the abscissa GH meeting the ordinate at 2,750 r.p.m. at H. The position of H determines the gear ratio, which is seen by interpolation to be 0.67.

(*b*) If the ordinate GF is produced to cut the abscissa at 10′ 0″ diameter their point of intersection gives the rotational tip speed, which is 960 ft./sec. As the specified maximum helical tip speed limits the rotational tip speed to 885 ft./sec., it is evident that either the diameter of the airscrew or the gear ratio must be reduced, and since a reduction in airscrew diameter is likely to have an adverse effect on the take-off thrust it is preferable to adopt the latter course. A process of trial and error must now be employed, using the construction described in the previous solution (*a*) with each " Blade-Material " line in turn and selecting the combination of diameter and gear ratio which gives closest agreement with the conditions specified. If this process is carried out it will be found that a 3-bladed wooden airscrew of 10′ 0″ diameter with a gear ratio of 0.61 will absorb the given power at the design speed and height, and will have a rotational tip speed of 880 ft./sec.

If, as is most probable, the range of gear ratios available does not include the ratio necessary to give the exact diameter required, the gear ratio giving the closest approximation is selected and the diameter adjusted by modification of the blade design.

To avoid any errors in finding the rotational tip speeds it must be understood that the curves of rotational tip speed are used in conjunction with the scale of diameters at the left side of the diagram and the scale of r.p.m., and that the ordinates such as BC and FG are drawn through the values of the airscrew r.p.m. for the respective airscrews. Consequently, when the conversion " Blade-Material " lines are used to read a diameter on the scale at the top of the diagram the diameter so found must be transferred to the appropriate ordinate at the point indicated by the left-hand scale in order to find the rotational tip speed.

SOLUTION of SIMULTANEOUS EQUATIONS

By E. J. RICHARDS, B.A., B.Sc.

MOST simultaneous equations obtained in stress work are those used for solving for the redundancies when the method of Strain-Energy is used. If, as is usual in most firms to-day, a machine is used, the errors incurred in this work are not so much those obtained due to the instability of the equations, but rather the fact that a check cannot be made until very late in the work, and that when an arithmetical error has been made it is difficult to locate it. The following method of solution, which is for the most part identical with that used at present, gives a good method of checking at a fairly early stage while the amount of work is reduced to half. This method is only of use when the number of cases to be examined warrants it.

Redundancies equations are unusual in that they are all obtained from differentiation of the same expression. The outcome of this is that the matrix formed by writing down the coefficients in a block is " symmetrical " (*i.e.*, the terms are symmetrical about the leading diagonal).

Method

Solve the equations in the usual way by reducing the coefficients of one variable to unity and subtract. Solve in the block form for the same number of cases as there are variables, as shown in the following table :—

Coefficient of Variable					Case				
A	B	C	D	E	I	II	III	IV	V
a_1	b_1	c_1	d_1	e_1 =	1	0	0	0	0
a_2	b_2	c_2	d_2	e_2 =	0	1	0	0	0
a_3	b_3	c_3	d_3	e_3 =	0	0	1	0	0
a_4	b_4	c_4	d_4	e_4 =	0	0	0	1	0
a_5	b_5	c_5	d_5	e_5 =	0	0	0	0	1

Reduce this until it takes the form, say

A	B	C	D	E	I	II	III	IV	V
1	—	—	—	— =	α_1	β_1	γ_1	δ_1	ϵ_1

Since the matrix on the right of the table is the unit matrix, then the complete solution to the five cases I to V will form a symmetrical matrix (*i.e.*, α_1, β_1, γ_1, δ_1, ϵ_1, will be the first column of the block as well as being the first row). Hence without working back to get other roots of case I, it can be stated that the solution is $A = \alpha_1$, $B = \beta_1$, $C = \gamma_1$, $D = \delta_1$, and $E = \epsilon_1$. A check can therefore be obtained at this stage of the proceedings for the work that has already been done. If the check is correct, then it is certain that there cannot be any arithmetical error up to this stage since the check involves all five cases.

In order to obtain the complete block of solutions, it is only necessary to work out the values on and above the leading diagonal. The other values can be filled in from symmetry.

The complete solution block, when completed, will be as follows :—

Coefficient of Variable					Case				
A	B	C	D	E	I	II	III	IV	V
1	—	—	—	— =	α_1	β_1	γ_1	δ_1	ϵ_1
—	1	—	—	— =	β_1	β_2	γ_2	δ_2	ϵ_2
—	—	1	—	— =	γ_1	γ_2	γ_3	δ_3	ϵ_3
—	—	—	1	— =	δ_1	δ_2	δ_3	δ_4	ϵ_4
—	—	—	—	1 =	ϵ_1	ϵ_2	ϵ_3	ϵ_4	ϵ_5

Alternatively if every value on the right-hand side of the block is worked out a good check is obtained by comparing the values below the leading diagonal with the corresponding values above it. If these check up, then the whole block must be correct.

The solution to the equations

$$\begin{array}{llll} a_1 A_1 & + b_1 B & + c_1 C & + d_1 D & + e_1 E = p \\ a_2 A & + b_2 B & + c_2 C & + d_2 D & + e_2 E = q \\ a_3 A & + b_3 B & + c_3 C & + d_3 D & + e_3 E = r \\ a_4 A & + b_4 B & + c_4 C & + d_4 D & + e_4 E = s \\ a_5 A & + b_5 B & + c_5 C & + d_5 D & + e_5 E = t \end{array}$$

is then

$$\begin{array}{llll} A = \alpha_1 p + & \beta_1 q & + \gamma_1 r + \delta_1 s & + \epsilon_1 t \\ B = \beta_1 p + & \beta_2 q & + \gamma_2 r + \delta_2 s & + \epsilon_2 t \text{ etc.} \end{array}$$

Hence, once the block has been solved, as many cases can be considered as is necessary without any more work. If only one or two cases are under consideration a general solution of this type is probably not worth while, it being quicker to work out each case separately.

POWER and LANDING SPEED

The American View

AMONG the many forms taken by attempts to increase lift and so obtain the advantages of high wing loading while still retaining a reasonable landing speed is the use of the engine or engines to direct the slipstream on to a larger or smaller proportion of the wing, depending upon the number of power units used in any particular design.

The American National Advisory Committee for Aeronautics has been looking into this subject, and its conclusions are contained in one of the N.A.C.A. Technical Notes, No. 692, by Walter S. Diehl, of the Bureau of Aeronautics, Navy Department, Washington D.C., entitled "Some Fundamental Considerations in Regard to the Use of Power in Landing an Airplane."

Fundamental Considerations

In his introduction Mr. Diehl writes: "It is an obvious and a well-known fact that the 'landing speed' of an airplane depends on the amount of power being used and that the landing speed with power is lower than the stalling speed in a glide without power. There is no simple method of precise analysis that enables the calculation of the exact landing speed for any given airplane, but it is possible to obtain a very close approximation from consideration of the fundamental quantities involved." This Mr. Diehl proceeds to do, and he comes to the conclusion that "when secondary effects are neglected, the maximum available increase in lift due to power is equal to the thrust being developed. If the increase in lift due to power is expressed in coefficient form, very high values may be shown under conditions which, on analysis, are found to be wholly impracticable in flight."

The author, after recapitulating Newton's Second and Third Laws of Motion, goes on to say "Wing lift and propeller thrust are reactions obtained by imparting momentum to the air. The airplane wing derives its lift by imparting downward momentum to the air upon which it acts. Lift and vertical momentum imparted in unit time *must* be equal and opposite in steady horizontal flight. Lift can be increased only by increasing the downward momentum. This means increasing the mass of air acted on, increasing the downward velocity, or increasing the product of the two. The mass of air influenced by the wing is very great, even under normal conditions. The disturbance or downwash is perceptible about 20 chord lengths below the wing.

"Thrust is obtained from the axial momentum imparted by the propeller to the slipstream. In an airplane, the slipstream constitutes an increment in momentum that may be employed to augment the normal wing lift. However, the actual increase in lift so obtained can never be greater than the thrust. An apparent additional increase can, of course, be obtained in an airplane having poor wing-root fillets or nacelle fairings that cause an early breakdown in the air flow in the absence of the slipstream. This condition is not present in a good design and it may be neglected in this discussion."

A Simple Formula

Mr. Diehl then evolves a very simple, one might almost say elementary, formula for calculating the landing speed with power compared with the stalling speed without power, and compares the results given by the formula with results of flying tests of a Fairchild 22, given in Technical Note No. 604. The agreement is very close indeed.

He next examines the effect of slipstream on apparent maximum lift coefficient algebraically and plots graphs which, at first sight, seem to indicate very great increases in maximum lift coefficient. He points out, however, that the actual lift increase can never be greater than the thrust being developed, which rarely exceeds 4 lb./h.p. in the landing condition, and that in any case the power used cannot be greater than that required for horizontal flight, otherwise the aeroplane would climb. "In general," the author states, "this last restriction operates very effectively to limit the percentage of power that can be used on an airplane having a low power loading. Consequently, large increases in $C_L$max. are theoretically possible but highly impracticable."

TECHNICAL LITERATURE

For the Practical Man

"Aero Engines, Vol. II," by various Authors; 18s. net; Charles Griffin and Co., Ltd., 42, Drury Lane, London, W.C.2.

THE second volume of the book on aero engines published by Charles Griffin carries on the scheme begun in Vol. I, but whereas the first volume, by J. D. Frier, was of a theoretical nature (it covered thermodynamics, combustion, testing and cooling it may be remembered) the second volume is definitely intended for the practical man, the ground engineer and the student.

In planning this second book of the series two courses were open to the publishers: they could have described and illustrated in a somewhat sketchy manner all and every type manufactured, or they could select types of engine representative of certain broad general classes, such as radial, in-line, and vee. They have chosen the latter course, and we think have chosen wisely. In that way it has been possible to keep the book to a reasonable size and a reasonable price, and yet deal in sufficient detail with all the most important features and components.

Broadly speaking, the classification employed in the book is to take one engine of medium power and one of high power in each class, except in the case of the vee, in which no British engine of medium power exists. For the same reason the representative of this class is of necessity of the liquid-cooled type, there being at the present time no established British vee air-cooled engine.

Another alternative was represented by the choice of author or authors. The publishers might have commissioned one man to write the book, in which case he would have had to be an Air Ministry official, since few others would have the necessary intimate knowledge of all the engine types. Instead of that, the book has been compiled, as the preface explains, "either independently by a technical export connected with the particular engine maker's works, and with that manufacturer's authority, or officially, by the technical publications department of the company." This somewhat unusual course might easily have led to a book which was a mere "catalogue." Let it be said at once that such is not the case. The book is detailed, almost to a fault, and its text is confined to descriptive matter without any eulogistic tendencies.

For the classification of subjects the Armstrong Siddeley Cheetah IX has been chosen as representative of the medium-power radial, and the Bristol Pegasus as the high-power. The in-line type is represented by the De Havilland Gipsy Major and the Napier-Halford Dagger. The Rolls-Royce Kestrel represents the vee-type, and this section of the book is divided into two parts, the first dealing with the supercharged versions of the Kestrel and the second with the naturally aspirated.

The desire to make the book as useful as possible to the practical engineer and the student has resulted in a fairly uniform plan of treatment of all the different types of engine. First comes a general description, then chapters on installation, operation, inspection, stripping and reassembly. Maintenance and overhaul schedules are contained in other chapters, and everywhere one traces the hand of the expert who "knows what he is talking about."

To the student who wants to study British aero engines in great detail the book can be recommended. To the ground engineer who wishes to get his licence for several types of engine it is equally useful.

A useful feature is the index at the end. It is subdivided under the headings of the five engines covered by the book. The illustrations of components, units and assemblies are well chosen and well reproduced, and particularly valuable are the large folded charts showing the lubrication systems.

The only legitimate criticism that might be offered is that, to retain its usefulness for some years, the book ought to have included such engine types as the Bristol Taurus and the Rolls-Royce Merlin. One must, however, realise that a book has to go to press, and that there is always one or two more engines "just around the corner" if the publisher will only wait a few weeks.